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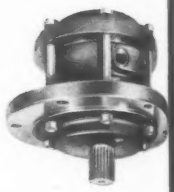

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A Modern Foundry with CONVEYORS by

Photograph shows:

The August's Mould Conveyor (closing to pouring, to cooling, to shakeout), which is a unit of the large August's Mechanised Sand Plant.

Photograph by courtesy of The INTERNATIONAL HARVESTER CO. OF GREAT BRITAIN LTD., DONCASTER.

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TRADE JOURNAL

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Ironfounding Industry in 1957

The Report on the Censuses of Production for 1955, 1956 and 1957*, covers the activity of iron foundries in Table 0, and carries comparisons with the years 1951 and 1954. During the period under review—in conformity with our recent Editorial opinion—the value of the output has been consistently increasing. It has risen from £150,000,000 in 1951 to £188,000,000 in 1957. The value of the actual production is one to two per cent. higher. Purchases of raw materials and fuel jumped from £60,000,000 in 1951 to £88,000,000 in 1957, but the cost of these goods which were actually used was, over the period, some one per cent. lower, and the stability of the market is reflected in the change of value of the stocks carried each year. Sometimes it increased by £1,800,000 and in other years by a mere £156,000.

Iron foundries must call in other firms for processing their castings to an extent much greater than we ever imagined. We suppose the figures given, in this context, which have increased in the period under review from £1,500,000 to £2,600,000, must relate to vitreous enamelling, shotblasting, heat-treatment and " blowhole " filling. Employment in iron foundries has steadily decreased over the years and for the section surveyed it declined from 120,706 in 1951 to 105,453 in 1957. Although these figures do not cover the whole industry, they should be representative of what has happened on a national scale in the industry. Though fewer were employed, the wages bill went up from £42,000,000 to £53,000,000.

Perhaps the most illuminating figures for future prosperity are those relating to the money spent on new buildings and plant. In 1951, £1,400,000 was spent on new building work, but by 1956 this figure had risen to £2,500,000 and in 1957 it was £2,300,000. The expenditure on new plant reached its maximum in 1957 at £6,200,000. In other years it was: 1951, £3,500,000; 1954, £2,900,000; 1955, £3,700,000 and in 1956, £5,800,000. From the figures published it is evident that there is quite a considerable secondhand market in foundry plant, as in each year dealt with there has been approximately £100,000 worth sold. Presuming this figure is, or will be, included in new plant, it makes but an insignificant impact on the gross figure. It is also revealed that the iron foundries are good customers of the transport industry. In 1957, they bought £618,000's worth of vehicles and paid £5,300,000 for the transport of their goods. Finally, it is pleasing to note that with all the labour-aiding equipment bought, the value of the net output per person employed has risen during the six years covered by the Census from £669 to £894.

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* Vol. 1. Published by Her Majesty's Stationery Office, York House, Kingsway, London, W.C.2; price 2s. net.

National Foundry Craft Training Centre

Full Report on Activities in 1958

During the year 1958, 127 apprentices attended at the National Foundry Craft Training Centre, and the courses held, together with the number of apprentices attending each, were as follows:—Three first courses, 40 apprentices; three second courses, 31 apprentices; three third courses, 31 apprentices and two fourth courses, 25 apprentices.

Training followed the same pattern as in previous years, the syllabus having become established from experience gained during the running of the Centre for the past ten years. The Centre, normally, can cater for 132 apprentices each year and it can be seen from the above figures that the capacity of the Centre was fully occupied in 1958.

Residential Club

The number of apprentices who resided at the club during their period of training at the Centre was 114, and this gives some idea of the national character of the Centre, a feature which is further emphasized by the fact that the founders using the Centre and club during the past year came from all parts of the British Isles. Members of the management committee continued to make regular visits to the club to meet trainees in residence.

Visits to Foundries

It is a normal part of the curriculum to visit different types of foundries during each course and a total of 35 visits were paid to foundries in the Midlands.

Acceptance of Applications

In the early part of the year, it became increasingly clear that with the number of applications which were coming forward there would inevitably be some delay in finding places for new entrants, and at one stage there was a waiting period of over 12 months. This position caused a great deal of anxiety both to the management committee and the trustees. As a temporary measure of relief, arrangements were concluded towards the end of the year, under which the training of apprentices undergoing second courses should be carried out at the training centre of the Stanton Ironworks, Company, Limited, near Nottingham. The trustees and management committee wish to express in this report their thanks and appreciation to this concern, for the offer to accommodate trainees during this difficult period.

Need for Expansion

The circumstances outlined in the proceeding paragraph emphasize the need for the expansion and in fact the rebuilding of the present Training Centre. It is worth recalling that when the idea of the Centre was first considered, it was established on the most modest lines in the nature of an experiment, and at that time it was visualized that if the venture proved a success similar training centres might be set up in other parts of the country. Experience proved that the Centre could provide a most valuable means of training for the industry's apprentices and it became the National Training Centre for the whole of the foundry industry. Due to lack of funds however, the Centre has had to operate under conditions which have imposed severe limits upon its activities.

The conviction is held that, had more commodious quarters been available both for training and residential purposes, the Centre would have made even more progress than it has done already. When one considers the establishments which have been set up for training on the Continent it is a reflection upon the foundry industry in the United Kingdom that the single training centre has such limited facilities.

Worshipful Company of Founders

During the year the Worshipful Company of Founders made an offer of an annual prize and diploma to be awarded to the best student completing his courses at the Centre each year. The management committee have been seriously considering the most equitable method of making this award and it will be first presented in 1959.

IBF New Address

The impending move of the head office of the Institute of British Foundrymen to London was announced in last week's issue. The new address will be 14, Pall Mall, London, S.W.1 (telephone whitehall 7141-2). (Communications posted to the Institute after November 12 should be sent to the new address.)

E. S. Lord's Raffle at Bingley Hall

As an added attraction during the Foundry Exhibition in Birmingham, E. S. Lord, Limited, sent out a special invitation card. Visitors to the Exhibition were asked to leave this card at the Lord stand, thereby qualifying for inclusion in a "draw" for a picnic case for four people. The case was won by Mr. C. E. Morrish (ironfoundry manager of Ball Bros. (Engineers), Limited, Stratford-on-Avon. In the illustration Mr. Morrish is seen receiving the picnic case from Mr. Tweedale, sales director of E. S. Lord, Limited. On the left is Mr. F. V. Ball, managing director, and on the right Mr. Wiles, works manager.

Modern Methods of Analysis for Cast-Iron

Report on the recent BICRA Conference in London

Representatives of 160 member-firms were present at the British Cast Iron Research Association's recent conference on "Modern Methods of Analysis," held at the Royal Commonwealth Society's Rooms, in London. The conference was designed to bring to the notice of chemists in the iron industry the recent work done in the Association's laboratories, and the research carried out by the Methods of Analysis Sub-committee.

BCIRA's recent conference in London was opened by Mr. P. A. Russell (of S. Russell and Sons, Limited), chairman of the BCIRA Research Board. Mr. Russell said that the Association's Methods of Analysis Sub-Committee, under its chairman, Mr. N. L. Evans (of Imperial Chemical Industries, Limited (Alkali Division)), was in a very real sense a working committee, and was carrying out exhaustive investigations on routine methods commonly in use, as well as investigating the applicability of the new methods. A handbook of selected methods, approved by the sub-committee, had just been published and was now on sale for the first time at the conference[1]. This handbook was designed to give the chemist at the bench a selection of tested methods. The first part dealt with the analysis of ordinary pig- and cast-irons. Further parts, to be published later, will deal with the analysis of alloy irons, ferro-alloys, slags, refractories, coke and other materials used in the foundry. Mr. Russell concluded by saying that a plastic binding had been used, which permitted the book to be used at the bench without damage to the covers.

Methods of Analysis Sub-committee

Its chairman, Mr. N. L. Evans, described the work of the Methods of Analysis Sub-Committee since its formation in 1950. Its representation, he said, was broadly based and included not only representatives of member-firms, but also users, other research associations and educational establishments. During the nine years of its existence a number of investigations had been carried out, and several papers had been published. The chairman paid tribute to all the members of the sub-committee for their very active co-operation in the practical work, and referred particularly to the work of Mr. W. E. Clarke, chief chemist at the Association, who had not only collaborated fully in the experimental work, but had also, in his capacity as Secretary, co-ordinated this work and prepared it for publication. In its earlier stages the sub-committee had also benefited from the advice and guidance of Mr. W. Westwood, former chief chemist of the BCIRA. The sub-committee had been mainly concerned until now with the perfecting of routine methods, and papers had appeared on total carbon[2], graphitic carbon[3], combustion sulphur[4], phosphorus[5], and bismuthate manganese[6]. The chairman ended by saying that attention was now being turned to methods suitable for submission as British Standards, and that co-operative work was being carried out on a method for magnesium in nodular-graphite irons developed at the Association's laboratories[7].

PAPERS PRESENTED

Sampling of Pig- and Cast-iron for Carbon Determination

By W. E. Clarke (chief chemist, BCIRA)

Mr. Clarke's paper dealt with the sampling of flake graphite and nodular graphite irons for carbon determination, and described one of the first co-operative projects carried out by the Methods of Analysis Sub-committee. It has been known for some years that solid samples must be used for certain types of casting, such as ingot moulds, if reproducible results were to be obtained. The sub-committee had set out to determine the limits within which drillings were permissible. Four different sampling techniques had been examined: (1) Solid samples; (2) drilling, with a ½-in. drill at a speed of 100 to 150 r.p.m. (the drillings then being used without further treatment); (3) drillings taken as in (2), but sieved on 60-mesh and proportionate parts used, and (4) drillings ground to pass through a 30-mesh sieve. It was found that solid samples were essential for accurate results with castings of heavy section containing large graphite flakes, and for all types of nodular graphite iron. For routine analyses of lighter-section castings drilling could be used, but the work had shown that sieving or grinding of drillings was inadvisable, since this invariably led to a loss of carbon. To obtain solid samples from an existing pig or casting, a hollow miller could be used or slices cut with a hacksaw. In sampling pig-irons, particularly sand-cast pigs, segregation of the carbon must be taken into account and a strip, representative of the pig from top to bottom, should be taken and cut into suitable-sized pieces (weighing about 1.5 gm. each) for carbon determinations. Carbon must be determined on each piece. The overall carbon content could then be calculated. When it was possible to sample liquid metal, the sub-committee had recommended that solid samples should be taken for carbon determination using either a pin mould (as recommended in BS.1837, Part 1, Amendment No.

1) or suction samples obtained with a silica tube of $\frac{1}{8}$-in. bore.

Application of the Rotary Sampling Machine to Cast-iron

By H. Green (BCIRA Chemical Section)

The above work had been carried out before the investigation of the rotary-sampling-machine technique, which is described in this paper. With this technique, representative samples can be obtained in less than a minute which gives excellent results for carbon and combustion sulphur on all types of iron. By slight modifications of solution technique the samples can be used for the determination of silicon, manganese and phosphorus. The machine described by Mr. Green was based on the original design of the late Mr. S. Westberg, but considerable improvements had been made to it in the Association's laboratories, partly as a result of tests carried out in the foundries of a number of member-firms[6]. Mr. Green's paper was accompanied by a short film, made at the Association, demonstrating the use of the machine.

Solvent Extraction Techniques in Ferrous Analysis

By W. E. Clarke

In this paper the principle, and some applications in the foundry laboratory, of solvent extraction techniques in separating interfering elements are described. The element to be removed is converted into an uncharged co-valent compound, which can be dissolved in an organic solvent immiscible with water and thus separated. Using the butyl-acetate separation, more than 99 per cent. of the iron present in a 5- or 10-g. sample can be removed by a single extraction. Using the conditions developed in the Association's laboratories solution and extraction take less than 10 minutes. This technique has been employed in the development of rapid methods for aluminium in cast-iron and ferro-silicon[9], magnesium in nodular iron[7], alumina[10], lime and magnesia[11] in slags, etc., and has proved particularly valuable in the analysis of trace elements. To illustrate the extreme simplicity of this technique a colour film made at the Association was shown. In this film the complete method for the determination of magnesium in nodular irons by the Rooney and Carter method was demonstrated by Mr. Clarke. In this method a 5-gm. sample is taken, dissolved in agua regia, and the iron removed by a butyl-acetate separation. After suitable adjustment of acidity the remaining traces of iron, together with titanium and other residual elements, are extracted with cupferron into chloroform. Nickel and manganese are then extracted as their diethyldithiocarbamate complexes. The magnesium is now left in a solution which is free from interfering elements, and can be titrated with E.D.T.A. In this pure solution the end-point is very sharp and easily detected, even in artificial light. The determination takes just under an hour.

Instrumentation in the Foundry Laboratory

By R. C. Rooney (BCIRA Chemical Section)

Mr. Rooney, who is engaged in the investigation of methods for trace elements at BCIRA, dealt very thoroughly, and with admirable clarity, with the various types of instrumentation now employed in analytical chemistry, and instanced their applicability to the problems now confronting chemists employed in foundry laboratories. He dealt exhaustively with the various filter-type absorptiometers and spectrophotometers now available, and compared the performance of filters with monochromators in the selection of narrow wavebands of light. Dealing with flame photometry, a technique of rapidly increasing importance, Mr. Rooney described the construction and performance of a sensitive recording flame spectrophotometer built at the Association. Members were invited to visit the Alvechurch laboratories to see a demonstration of this instrument.[12, 13]

Analysis of Cupola Slags

By W. E. Clarke

Analysis of cupola slags has recently become of increasing importance, and Mr. Clarke pointed out how the need for rapid results had led to the development of a new scheme of analysis. The disadvantages of the classical scheme were avoided by the use of (*a*) instrumental methods, *e.g.*, spectrophotometric methods for iron, manganese and titanium; (*b*) volumetric methods, either not requiring preliminary separations or using solvent extraction separations, and (*c*) by making each determination separate, so that hiding of errors in summation was avoided.

Spectrophotometric Detection of End-points

By J. Sneddon (BCIRA Scottish Laboratories)

A paper by Mr. J. Sneddon, of the Association's Scottish Laboratories (read in his absence owing to illness by Miss H. Horton) described experiments he had carried out on the detection of end-points in E.D.T.A. titrations of calcium and magnesium, using an absorptiometer or a spectrophotometer, This method overcomes the difficulties encountered by some analysts in detecting these endpoints visually.

Analysis of Trace Elements in Cast Iron

By R. C. Rooney

Mr. Rooney, who has specialized in this field, referred to the recent metallurgical interest in trace elements, and the need for accurate methods for their determination. Even using modern instruments, like the cathode-ray polarograph, separations were generally necessary. The older precipitation methods, such as zinc oxide, were usually unsatisfactory when really low-level traces were in question. This had led to an examination of several separation techniques, including chromatography and ion-exchange, but solvent extraction

had been found to be the best, most generally applicable and simplest method. For the final determination, a modern polarograph, spectrophotometer, flame photometer or fluorimeter could be used. A factor limiting the lower level of determination was the blank from reagents, which Mr. Rooney considered should never be more than 50 per cent. of the total.[14, 15, 16, 17]

CONFERENCE DINNER

On the evening of the first day of the conference a dinner was held at the Connaught Rooms, Gt. Queen Street, Kingsway, London, W.C.2, and was attended by a considerable proportion of the delegates. The chair was taken by Mr. N. L. Evans, chairman of the BCIRA Methods of Analysis Sub-Committee. Amongst the guests was Mr. C. R. B. Spencer, general secretary of SIMA.

EXHIBITION OF EQUIPMENT

An exhibition, arranged by the Scientific Instrument Manufacturers' Association, of equipment for instrumental methods of analysis was held during the conference. The participating firms, and their displays, were as follow:

Electronic Instruments, Limited—fluorimeter, auto titrometer M24 and Ph meter 23A.

Evans Electroselenium, Limited—titrator, absorptiometer, colorimeter and flame photometer.

Evershed & Vignoles, Limited—two Tinsley polarographs.

A. Gallenkamp & Company, Limited—two furnaces.

Griffin & George, Limited—gas liquid chromatography outfit and Griffin-BCRA bomb calorimeter outfit.

Hilger & Watts, Limited—H.750 Spekker absorptiometer, H.700 Uvispek spectrophotometer and direct-reader spectrograph.

Nash & Thompson, Limited—polaroscopes.

L. Oertling, Limited—balances.

Southern Instruments, Limited—absorptiometers and polarographs.

Townson & Mercer, Limited—vacuum moisture-testers and Ströhlein carbon-in-steel estimation apparatus.

Unicam Instruments, Limited—SP.600 spectrophotometer and SP.900 flame spectrophotometer.

Some of the displays are dealt with at length in the following paragraphs:

Electronic Instruments, Limited

Direct-reading Fluorimeter: A sensitive and stable instrument designed to measure concentrations of solutions. Most solutions which fluoresce in the visible spectrum can be analysed. The instrument has high discrimination and is suitable for measurements of the trace concentrations of certain metals. It has a concentration range between 1 part in 10^{-6} and 1 part in 10^{-10}.

Direct-reading pH Meter (Model 23A): A meter for the measurement of acidity and alkalinity. Two of its many applications are the pH measurement of sand, and the pH of galvanizing solutions. It can also be used for redox titrations to determine iron.

Automatic Titrimeter: Instrument which performs automatically routine laboratory titrations. It will titrate solutions containing metals such as cobalt, aluminium, copper, iron, chromium and manganese, and can also be used in carbon and sulphur determinations. pH, redox, complex forming or precipitation titrations can be performed with suitable electrodes. Two input sockets are provided so that two separate and different titrations can be performed in sequence.

Hilger & Watts, Limited

Spekker Absorptiometer: Used for routine analysis of ferrous and non-ferrous alloys, cast-iron, etc., by photoelectric colorimetry. The sample is dissolved and a suitable reagent used to form a coloured complex of the element being determined. The Spekker has a null-setting measuring system, which uses two balanced photocells. Readings of either optical density or transmission can be taken from the long linear scale, which is graduated from 0 to 1.3D.

Uvispek Spectrophotometer: An instrument which covers the visible region of the spectrum, and the ultraviolet region, where many metallic compounds have their main absorption bands. It may also be used for flame photometry and atomic-absorption spectroscopy.

Hilger Polyvac Automatic Spectrograph: Used for measurement of the intensity of spectrum lines emitted by elements when they are excited in an electric discharge. The whole sequence of operations is controlled automatically—from the time the operator puts the sample in the discharge stand to the time the instrument presents the results of the analysis tabulated on a sheet of paper. There are two models of the Polyspek, one with a single direct-reading head, the other with two; the latter model has also provision for photographing the spectrum. Each direct-reading head deals with 12 elements, one of which must be used as an internal standard—generally the base metal. Thus the Polyspek-24 may be used for determining 11 elements in two differently-based alloys, or 23 elements in a single alloy. The time taken to analyse 23 elements is about four min., and about two min. for 11 elements.

Nash and Thompson, Limited

L.P.54 Polarograph: is a conventional d.c. polarograph with one unusual feature which makes it semi-automatic. A recorder is built into the instrument, and light reflected from the galvanometer shines on the paper from behind. The knob which increases the voltage across the electrolyte cell also advances the recorder paper, and one can plot the polarographic curve directly on to the paper. Sensitivity is similar to other d.c. polarographs.

L.P. 55A Polarograph: A photographic recording instrument in which great sensitivity is obtained by suspending the galvanometer on a cantilever 3 ft. above the instrument. Operation is motorized and fully automatic, once the voltage range that it is required to scan has been set on the instrument. Automatic recording of abscissae after every 100 or 200 mv., is performed.

P.567 Polaroscope: An oscilloscope specially adapted to polarographic analysis. The oscillogram shown on the CR tube is oval in shape for a pure basic electrolyte, the upper half representing the cathodic, and the lower half the anodic process. Following the introduction of a depolarizer into the electrolyte, the curve shows incisions in both anodic and cathodic parts. The depth of the incision is proportional to concentration, and its position is characteristic of the depolarizer. The method is suitable for analysis in the concentration range 10^{-3} to 5×10^{-5}M. Lower concentrations can be reached by special techniques. Titrations can be

Modern Methods of Analysis for Cast-Iron

performed by using twin electrode systems, and adding titrant until the depth of incisions coincide.

L. Oertling, Limited

One-pan balances: Range of balances incorporating full mechanical manipulation of all weights on all models. The beam is of delta form made from light alloy and, together with all the mechanism, is totally enclosed. Release of the balances is operated by a press bar, and the knives and planes are fully protected from damage by the Release-o-matic mechanism. The controls are grouped in order to give rapid and fatigue-free weighing. The pans are designed for ease of access, and the appearance of the instrument is suitable for both old and new laboratories.

It has been designed to give the user reliable and rapid weighing with a minimum of service and attention. The range of balances available is as follows:

Model	Capacity	Sensitivity per half division	Mean Standard Deviation
HO1	200 gm.	0.10 mgm.	0.05 mgm.
HO2	200 gm.	0.50 mgm.	0.20 mgm.
HO3	100 gm.	0.05 mgm.	0.03 mgm.

Two-pan balances: This range of balances includes a semi-micro balance with a sensitivity of 0.1 mgm. per scale division (Model FO7), with automatic weight manipulation up to 1 gm. The full range now comprises fourteen different models, with different sensitivities.

Southern Instruments, Limited

*K*1000 *Cathode-ray Polarograph:* Amongst advantages claimed are: the entire polarogram is reproduced on the screen once every seven sec.; very small currents may be measured and made to occupy the full scale, the effective sensitivity being increased by the peaked nature of the waves, especially in the case of multi-electron reductions; the shape of the waves is such that waves differing in half-wave potential by as little as 0.05 v. may be separately measured. A derivative circuit is brought into operation (a) to resolve two direct peaks which are close together, or (b) to measure the concentration of a trace element when a large preceding reduction is taking place.

*K*636 *Anodic Conversion Unit:* This instrument enables the cathode-ray polarograph to be used for the determination of waves due to oxidation, in addition to and without interference to its normal use for reduction waves. It comprises a cathodic-anodic switch, a 2-v. dry accumulator, together with the necessary connectors to the mercury electrode system and to the polarograph.

Townson & Mercer, Limited

Vacuum Moisture-tester: for accurate estimation of the moisture content of foundry sand, coal and coke. Weighing and heating is carried out in a vacuum, which makes for accuracy irrespective of treatment of the sample.

Carbon-in-steel Estimation Apparatus: A modern edition of the well-known system for estimating carbon in steel by burning off a sample of the steel in a current of oxygen and absorbing and measuring the volume of CO_2 produced. By means of a special calibrated and movable scale a direct reading of the percentage of carbon may be obtained with a simple absorption. Two types of instruments are available, one with a scale reading directly from 0-1.5 deg., the other reading from 0-4.5 deg.

Unicam Instruments, Limited

*SP.*600 *Spectrophotometer:* with a range of 360-1000mμ is suited to a great variety of metallurgical determinations. It is a true spectrophotometer, employing a glass prism which makes for precise wavelength selection over a wide range. A series of free detailed method sheets is published for use with the instrument, many of them dealing specifically with metallurgical determinations.

*SP.*900 *Flame Spectrophotometer:* A large number of metallic ions, when suitably excited in a flame, give out a characteristic emission which may be measured for the purposes of qualitative and quantitative analysis. The method has the particular advantages of speed, and a minimum of sample preparation.

A fused-silica prism and photomultiplier detector, in incorporated and the range 250-1020mμ is covered. Basically, the instrument is direct-reading, with a spot galvanometer, but a signal outlet is provided for alternative use with a standard potentiometric recorder.

A. Gallenkamp & Company Limited

Tube Furnace (*FS*-205, *size* 1): has a maximum temperature of 1,200 deg. C., and is manually controlled; internal dimensions of this model are 12 in. by 3 in., but larger sizes are available.

Tube Furnace (*FS*-400, *size* 1): This furnace operates at a maximum temperature of 1,500 deg. C., with automatic controls. It is used with a special transformer, in which the output voltage is automatically adjusted to compensate for changes in element resistance with temperature, or due to ageing.

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WILMOT-BREEDEN (HOLDINGS), LIMITED—Mr. J. T. Cross has been appointed a director.

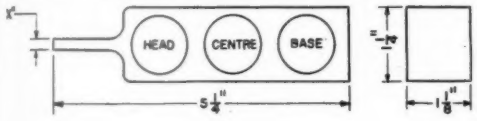
American Letter

Ultrasonic Testing of Aluminium Castings*

High-strength, high-ductility aluminium castings have become a commercial reality. Since in some cases radiography does not clearly distinguish between high-quality and ordinarily acceptable aluminium alloy, there is a real need for a non-destructive test method to do this job. Commercially-available ultrasonic test equipment was used throughout an investigation which was carried out by the authors. This equipment was a combined pulse generator and signal receiver.

First Experiment

Castings as shown in Fig. 1 were made, at a pouring temperature of 698 deg. C. One casting (Group 1) was poured from a heat degassed for 10 min. with chlorine, another from a heat which was untreated (Group 2), and a third from a heat which was stirred 2 min. with green wood (Group 3). Each casting consisted of five samples, with different-sized gates, which were cast simultaneously from a central hub. Each sample was identified as to pre-pour treatment (Group 1, 2 or 3) and gate size (A. B, C, D or E). The samples in Group 1 were designed to be least porous, Group 2 more porous, and Group 3 most porous. Fig. 1 shows where each specimen was ultrasonically examined, at positions designated head, centre and base.



GATE	A	B	C	D	E
X	3/16	5/16	9/16	7/8	1 1/4

FIG. 1.—*Diagram of one of the samples used in experiment 1, showing the parts which were ultrasonically tested.*

Results:

It was found that, for a given gate size, ultrasonic attenuation increased as porosity increased. Variations in the degree of porosity within any one sample were readily apparent. The head sections of samples with the smaller gate sizes tended to be more porous than the base sections, which fact was substantiated by radiographs. Reflectograms showed that ultrasonic attenuation tended to increase at the head sections.

Second Experiment

Aluminium-alloy test-plates (7 per cent. Si—0.3 per cent. Mg) were then cast, with a chill on one edge and a riser at the opposite edge. Near the chill the tensile properties obtained were 16.9 tons per sq. in. ultimate tensile strength, 11.6 tons per sq. in. yield strength, and 8 per cent. elongation. Near the riser the properties fell off to 14.7 tons per sq. in. ultimate tensile strength, 11.6 tons per sq. in. yield strength, and 2 per cent. elongation. Radiographic examination was not sensitive to these changes, but when ultrasonic attenuation measurements were made at various locations in the plates there was a definite increase in attenuation in a direction away from the chill edge. Other experiments were made on samples (5 per cent. Si) with various gas contents, and it was shown that the attenuation characteristics were markedly affected by the presence of gas and microshrinkage in the samples. The ultrasonic test does not, however, distinguish between coarse and fine grain sizes.

* Synopsis of a paper, by H. Smolen and H. Rosenthal, presented at the AFS Congress in Chicago (April 13 to 17), and published in full in the May issue of *Modern Castings*. Mr. Smolen is electronic scientist, and Mr. Rosenthal, metallurgist, at Frankford Arsenal, Philadelphia.

Tensile and Shear Strength of Green Sand*

The authors concluded that the moisture content of a green-sand mixture largely controls its green shear and tensile strengths, and that decreasing tensile and shear strength occurs beyond that moisture content which is required to coat the sand grains and clay. The authors also studied the effect of varying degrees of ramming on green tensile and shear strength, using AFS rammers equipped with two different ramming weights (14 and 2 lb.) which were dropped a distance of 2 in.

Effect of Increased Ramming

It was found that increased ramming caused green tensile strength to reach a maximum of between 3 to 4 lb. per sq. in. in the 8-per cent. western-bentonite mixtures. Above this percentage, increased ramming caused erratic green tensile strength. Experiments with the 10- and 12-per cent. western-bentonite mixtures showed that green tensile strength increases uniformly as the shear strength increases, due to ramming to higher bulk densities and mould hardness. At the 10- to 12-per cent. western-bentonite level, tensile strength does not level off at a fixed value as in the case of the 8-per cent. western bentonite, even when rammed to an average mould hardness of 95. The higher-clay-content mixtures are regarded as clay-saturated sands, *i.e.* sands in which the addition of more clay does not produce a further increase in strength at a given hardness. Southern-bentonite and fire-clay bonded sands were studied in the same way. Since the relationships of green shear, tensile and compression strengths, mould hardness and bulk density proved to be similar to those obtained with western bentonite, the same conclusions were drawn.

Effect of Sand Fineness

The effect of sand fineness and sieve analysis on green tensile and shear strengths was also investigated. Sands varying in fineness from AFS 49 to AFS 85 showed no effects on the relationship of green tensile, shear strength, etc. The green tensile, shear and compression strengths, and mould hardness relationships, were not affected by cellulose additives.

High-hardness Moulds

The results of these experiments have important applications in green-sand-moulding operations. For example, if a moulding sand containing 4-per cent. clay is moulded on powerful moulding equipment to hardnesses greater than 90, the mould is likely to crack, drop or hang-up on the pattern. On the positive side, a clay-saturated sand is one best suited for producing high-hardness moulds (90 to 95 mould hardness), and high-strength moulds. Powerful moulding equipment may be used to develop high-strength moulds, which can be drawn from patterns without mould failure.

* Synopsis of a paper, by R. W. Heine, E. H. King and J. S. Schumacher, presented at the AFS Congress in Chicago (April 13 to 17), and published in full in the April issue of *Modern Castings*. Mr. Heine is associate professor, University of Wisconsin, Madison; Mr. King is president, and Mr. Schumacher chief engineer, at Hill & Griffith Company, Cincinnati, Ohio.

Learning to Cast Steel at Lloyd's

A Day in the Lives of three Young Men

The heading illustration shows the three young men entering Bourne House, F. H. Lloyd's training centre. On the lowest step is Jack, his face betraying slight inward trepidation because it is his first day. Harry, in between, has an air of greater assurance stemming from his three-year status. Jim, on the threshold, radiates good-humour and confidence; at the end of his five-year apprenticeship he faces the future backed by the knowledge of a craft well learned.

Well-established now is the apprentice-training centre of F. H. Lloyd & Company, Limited, at Bourne House, near the company's main works at Wednesbury, in the heart of the industrial Midlands. To indicate the way in which training for steelfounding is organized at the centre, accounts of their day's experiences were compiled for three young men, who for this purpose shall be covered by the *noms des plumes*, Jack, Harry and Jim. For Jack it was his first day at the Centre; Harry was in the middle of the course and Jim had arrived at its final stages. These accounts of the Lloyd training set-up—which covers also the requirements of other steel foundries (Parker Foundry (1929), Limited, and Lloyd's (Burton), Limited) in the group—are especially interesting at the present time as it is likely that—subject to approval from the main European Committee—the practical work of next year's International apprentice Competition will be staged at the company's main works.

Jack's First Day

I walked up the steps to Bourne House, straightened my tie and tried to look confident. This was the F. H. Lloyd company's training department, where I was to spend much of my apprenticeship to steelfounding—which I had already learned at my interview consists of every job between pattern-making, moulding and despatch of finished castings. It had also been made clear that the way to an executive position with the firm was open to me if I proved capable of benefiting from further instruction. I had also been told that, initially, the staff of Bourne House, consisting of the training officer, physical-training instructor and the foundry and engineering instructors, would regulate my future.

On entering the Centre, I was welcomed by a secretary who ushered me into a room where more apprentices were waiting. At 8.30 a.m. we were shown into the lecture room, where we were told to write our names on cardboard so that we could be identified at a glance. After this we were introduced to members of the staff. The next thing on the programme was to get "signed on"; this consisted of a visit to the works' employment office—the signing of various forms and receiving leaflets, sick-benefits booklets and information of a general nature.

At about 9.30 a.m. we were shown a film of F. H. Lloyd's works and at "break"—10.0 a.m.—we were taken to the dining room where the boys eat. After this we were given a test, one of three, each getting more difficult.

11.15 a.m. was physical training time and I'm sure I've never had so much exercise. In shorts and vest we ran to the p-t field, where we played soft-ball and took part in various exercises. This we did until 12.15, when we ran back to Bourne House, had a shower and got dressed. Then we were shown how to "clock in", and were told to be back to punch the clock before 1.30 p.m. I think the first day I was back at 1.10 p.m., for fear of being late.

Re-assembling at 1.30 p.m., we were told we were to have a talk by the wages supervisor on the subjects: wages and how they were compiled; the necessity for clocking in and out; about sick pay, and generally all that an apprentice should know about the wages department. His talk continued until about 3.0 p.m. At this time we felt more relaxed, and the training officer and an instructor made tape-recordings of our names, addresses and ambitions. After tea break (3.40 p.m.) we were taken to the medical department, where we were examined and measured for height and weight.

At about 4.30 p.m. we were given blocks of wood of varying shapes and indulged in some sketching practice. To wind up the day we were told what we were going to do on the following day and at 5.30 p.m. we "clocked out," feeling we had made an entry into the industry and finding it a little less bewildering than we had feared.

TABLE 1.—*Typical Apprentice Record Card (Front Side) compiled in the Training Department of F. H. Lloyd & Company Limited.*

Name: *John William Smith.* Date of Birth: *12.9.38.*
Address: *5042, Park Lane, Wednesbury.* Date Engaged: *22.8.55.*
Clock No.: *Z.220.*
Apprenticed as: *Moulder.* Date: *22.8.55.*

Date.	Move to:	Total period in department.	Report from:	1	2	3	4	5	Total.	Remarks, awards, etc.
22.8.55	*F.T.S.*									
10.2.56			*F.T.S.*	*17*	*26*	*13*	*18*		*74*	*1956*
4.5.56	*28.3.56, Sand Lab.*		*F.T.S.*	*17*	*30*	*17*	*18*	*1*	*82*	*Works Reports 76* — *90 per cent*
24.5.56			*S.L.*	*17*	*26*	*17*	*18*		*78*	
20.8.56	*20.8.56, J.2 Box*		,,	*17*	*26*	*17*	*15*	*2*	*75*	*Timekeeping 14*
			J.2	*17*	*26*	*13*	*15*		*71*	*1st Year, Group 2. £4*
19.11.56	*Methods*									
4.1.57			*Methods*	*13*	*17*	*26*	*10*	*2*	*66*	
11.2.57			,,	*13*	*26*	*13*	*15*		*71*	
4.3.57			,,	*17*	*26*	*13*	*15*		*71*	
2.4.57			,,	*17*	*26*	*17*	*18*	*2*	*78*	
30.4.57			,,	*17*	*26*	*13*	*15*	*1*	*71*	
25.5.57			,,	*17*	*26*	*17*	*15*	*1*	*75*	*1957 Works Reports 72* — *85 per cent*
	27.5.59, J.2 Box	*3 Periods*								
28.6.57			*J.2*	*17*	*26*	*13*	*15*		*71*	*Timekeeping 13*
28.7.57			,,	*17*	*22*	*13*	*15*		*67*	*2nd Year Group 2. £8*
29.8.57			,,	*17*	*22*	*13*	*15*		*67*	
23.9.57			,,	*20*	*26*	*17*	*18*	*1*	*81*	
16.10.57	*16.9.57, J.2 Cover*		,,	*17*	*30*	*17*	*15*		*79*	
8.11.37			,,	*17*	*30*	*17*	*18*	*2*	*82*	
30.11.57			,,	*20*	*26*	*17*	*15*		*78*	
9.12.57	*J.2 Sweeps*	*3 Periods*	*H. Taylor*	*17*	*26*	*13*	*15*		*71*	
9.1.58			,,	*17*	*26*	*13*	*15*		*71*	
10.2.58			,,	*17*	*30*	*17*	*18*		*82*	
28.2.58	*3.3.58, J.2 Closing*	*3 Periods*	,,	*17*	*30*	*17*	*15*	*1*	*79*	
29.3.58			,,	*17*	*30*	*17*	*18*	*1*	*82*	
27.4.58			,,	*17*	*30*	*17*	*18*		*82*	*1958 Works Reports 78* — *91 per cent*
25.5.58	*26.5.58, Furnaces*		,,	*17*	*30*	*17*	*18*		*82*	
22.6.58			*P. Sanders*	*13*	*30*	*17*	*18*		*78*	*Timekeeping 13*
20.7.58			,,	*17*	*30*	*17*	*18*		*82*	*3rd Year, Group 1. £15*
17.8.58			,,	*17*	*30*	*17*	*18*		*82*	
14.9.58			,,	*17*	*30*	*17*	*18*		*82*	
12.10.58			,,	*17*	*30*	*17*	*18*		*82*	
9.11.58			,,	*17*	*30*	*17*	*18*		*82*	
7.12.58	*1.12.58. Lab.*	*6 Periods*		*17*	*30*	*17*	*18*		*82*	
4.1.59			*L. T. Hughes*	*17*	*26*	*13*	*18*		*74*	

KEY

1. Knowledge of Job
2. The Way the Job is Done
3. Conduct and Behaviour.
4. Personal Qualities, etc.
5. Timekeeping.

Final Remarks

In this illustration the apprentice is working on his own, putting the finishing touches to a mould before closing and casting is carried out.

Harry Gains Experience

In my three years as an apprentice at F. H. Lloyd's, I have worked in several of the moulding departments, the coremaking shops and service departments. I am now in the medium-size-box moulding section.

On reporting to my supervisor this morning, I was given a job—to make a roller blank—which would weigh 700 lb. When the pattern was brought to my "standing" (work place) the supervisor came and discussed the best way of making the mould—where the "heads" should be, how it should be run, where the joint should be made, and also giving me special instructions from the works' method's engineer—it was probably the biggest job I had tackled on my own so far.

I questioned him on the amount of tackle I should need, and then I was able to start—checking and measuring up the pattern. I ordered my moulding boxes, and the lifting bars and lifters I would want. Some special sand was delivered to my standing and I was able to start moulding.

The actual moulding was fairly straightforward, except for an area which was to be made in a highly-refractory sand, over which extra care had to be taken. (The Sandslinger certainly makes the filling up of a box this size quicker and easier). After strickling-off the box, a plate was clamped on and the box turned over—the joint was again quite straightforward—and, after bedding-in the guides, the top box-part was lowered on by crane, parting sand was applied, heads, runners and sleeves positioned and we began the top part, again using the special sand. After tying in the box bars and placing the lifters, I had to hand ram the lifters into place, the 'slinger again making short work of finish ramming this top part.

Whilst waiting for a crane lift to part my half moulds, I cleared up the standing. (It is surprising how much sand and tackle can accumulate around a job). Then I saw with amazement that it was already 4.30 p.m.—and I had to leave work early that evening to attend the local technical college—I am taking my Intermediate City and Guilds examination this year in Foundry Practice and Patternmaking.

After clamping on the external box-guides and marking up the top box, the top part was lifted off and turned over—luckily the top lifted very cleanly and not much patching-up was necessary. I only needed to "nail" the top face

Here the apprentice, supervised by a skilled moulder, is placing lifters in a complicated mould, prior to ramming the top section.

TABLE 2.—*Technical College Record of F. H. Lloyd Apprentice.* (*Reverse of Card Reproduced in Table 1.*)

Year 1955-6. College—*County Technical College, Wednesbury*

Course.	Subject.	Report details.	Course result.	Award.
DM1 (B)	*Chemistry*	*2nd Class*	*2nd Class*	*£2*
	Physics	*2nd* ,,		
	Maths.	*1st* ,,		
	Eng. Drawing	*2nd* ,,		

Year 1956-7. College—*County Tech. College.*

Course.	Subject.	Report details.	Course result.	Award.
DM2 (C)	*Chemistry*	*2nd Class*	*2nd Class*	*£4*
	Intro. Metallurgy	*2nd* ,,		
	Physics	*2nd* ,,		
	General Metallurgy	*2nd* ,,		
	Maths.	*2nd* ,,		

Year 1957-8. College—*County Tech., Wed.*

Course.	Subject.	Report details.	Course result.	Award.
DM3 (E)	*Chemistry*	*2nd Class*	*2nd Class*	*£12*
	General Met.	*2nd* ,,		
	Physics	*2nd* ,,		
		Ordinary National Certificate Examination		

Year 1958-9. College—*County Technical College, Wednesbury*

Course.	Subject.	Report details.	Course result.	Award.
D4 M. (B)				

(Space for other years.)

and paint over the mould surface with a refractory wash. The time was 5.0 p.m.; my tools had to be cleaned and locked away.

A quick cycle ride home, a wash and change, and time for tea, left me just enough to check my books before leaving for technical college—hoping my homework was O.K.

Jim tackles Anything That Comes Along

My work in Methods Department at Lloyd's is primarily concerned with foundry tackle and equipment—I can never prophecy just what jobs I will be called upon to do. Calls for service can vary from the comparatively simple removal of an awkward pin from a bush, to the more complicated investigation needing the production of drawings and prototypes of equipment. However, my day is planned to a certain extent in a job list, this being a record of work on hand—completed jobs, jobs in progress and those awaiting attention.

This morning I had to check the progress on a

One of Lloyd's apprentices receiving instruction in foundry methods at the drawing board.

pair of patternplates for a new production order, which were being machined in the works' machine-shop; then there was a call to the machine-moulding shop to investigate a case of severe cross-jointing. The trouble was eventually traced to the actual locating bushes—new bushes are to be used to rectify this.

The next job on my list was an investigation as to the possibility of increasing the capacity of patternplates on a new mechanized moulding set-up. After observation of the set-up, and discussion with the supervisor, it appeared possible to increase the capacity, if some small electrical gear on the layout was re-located. While studying the machine drawings it was clear that, although this would do the job, a simpler and cheaper method could be devised.

After dinner, I assisted in an experiment to ascertain the performance of several types of exothermic materials. These we incorporated in various controlled moulds, which were later teemed in the foundry—the resultant castings to be cooled, cleaned and sectioned for micro-examination of their metal structure. Difficulty in the production of some small cores necessitated my next job. This was investigated and recommendations were made.

My last job was to accompany the methods superintendent on an investigation into a flaw in a certain section of an important casting. This was classified, and on his instruction I sketched a suitable modification for consideration.

APPENDIX

It is clear from the reports recorded here that apprentices within this group of steelfoundry companies are being fitted to help in moulding the future of the industry.

To assist other founders in formulating their own schemes of training, the basic curricula used by Lloyd's are reproduced in this appendix. Tables 1 and 2 show typical examples of how a trainee's progress is recorded. These records are not exhaustive, however, nor do they make references to many of the extra-mural activities—one of the latest of these being camping week-ends in Snowdonia, run much on the same lines as the "Outward Bound" schools.

Owners of small foundries would naturally find it difficult to emulate the comprehensive training schemes described, but for them participation in the Craft Training Centre arrangements or in local group activities can usually be made possible. Ironfounders are particularly well catered for in this respect.

In addition to the personal record-cards for apprentices, reproduced earlier, a planning board is maintained in the Training Centre (Bourne House) to record progress of each individual. At present about 110 young men are doing courses, the emphasis being, at the moment, rather more on the engineering than the foundry side. Apprenticeship schemes of this nature have been running at Lloyd's since 1947, and Bourne House itself was opened in 1953.

Works Training Area

The foundry training school is housed in the main works nearby. In the foundry itself a part of one of the moulding bays is reserved for intermediate training of apprentices. In the foundry school, an electric gantry crane of 3-tons capacity spans the training area, this being operated from a pendulum control. The floor is of concrete; molten metal can be brought in by a ladle carried on a bogie from one of the melting bays of the main foundry. To show the principle of operation, a moulding machine (a BMM pin-lift jolt/squeeze model) is available in the training foundry, along with compressed-air supplies and a gas-fired mould-drying stove. Sand supply is by dumper truck from the main foundry; bench core-making is also taught in the area, and moulds—either of green-sand or skin dried—for castings up to half-ton are prepared here by the trainees.

The training section of the foundry has been attractively decorated in a pleasing colour scheme and is heated by electric radiant-panel heaters. There are insulating panels fixed to the roof and some sound proofing has been arranged. The permanent staff of the school includes a full-time instructor who possesses a full technological certificate in foundry practice and patternmaking, and who has also passed through the special F. H. Lloyd supervisory training course (of 18 months' duration). It is interesting to record that a comprehensive system of monetary-prize incentives is in vogue at Lloyd's for apprentices, based on working and technical college records. These prizes, which may each go up to £50 in value, are distributed annually, merit being assessed on marks awarded.

It remains for the writer to record his thanks to

the directors and staff of F. H. Lloyd & Company, Limited, who made possible this account of their training facilities and provided illustrations.

FIRST YEAR.

(a) *Industrial Information Course.*

General industrial administration lectures, films and visits.

Factories Acts: Safety regulations—protective clothing, etc.; wage payment schemes; industrial health (including medical examinations).

Welfare Facilities: Paid attendance at technical college; organized physical education; organized indoor and outdoor sport; organized courses (national and local) in sport and recreational activities; protective clothing—overalls,safety shoes, goggles, etc.

Canteen Facilities: Meals and milk at reduced prices.

(b) *Foundry Training Curriculum (common to all foundry apprentices for the first two years).*

Basic Moulding: Moulder's tools and equipment and their uses; accident prevention in the workshops; use and care of pattern equipment; ramming, jointing and finishing of moulds; mould reinforcement (internal and external); venting and closing; moulding methods—including lifter-ing; feeding and gating methods; use of chills and other aids to solidification; casting defects—causes and remedies, and mould drying.

Basic Coremaking: Core boxes; types of cores and their uses; venting; methods of locating cores (prints, chaplets, studs, etc.), and reinforcement.

Sand: Origins; basic properties; additions, and their effects; sand testing and control, and special sands.

Metal: Melting units; metal production (emphasis on "steel"); teeming; uses of fluxes; casting solidification, and temperature control.

Inspection and Testing: Quality control; testing (chemical and physical); special techniques (X-rays, ultrasonic and high- and low-temperature testing).

(c) *Technical College.*

National Certificate and City and Guilds Certificate courses in foundry practice, patternmaking and metallurgy.

SECOND YEAR.

(a) *Practical Moulding and Coremaking.*

Medium-box moulding; foundry aids (Sandslingers, moulding machines, etc); medium coremaking; mould closing (including coring-up); sand testing and control.

(b) *Technical College.*

Intermediate certificate course for City & Guilds' Foundry Practice and Patternmaking.

* * * *

SPECIALIZATION FOR THIRD, FOURTH AND FIFTH YEARS.

a) *Moulder and Coremaker.*

Third year.	*Fourth year.*	*Fifth year.*
Heavy-box moulding Sweep moulding Floor moulding Light coremaking Medium coremaking Heavy coremaking Closing and coring-up.	Continuation as third year.	Specialization, moulding, core-making, closing.

Technical College.
City & Guilds courses in Foundry Practice.

Technical College.
Final City & Guilds Certificate in Foundry Practice.

* * *

(b) *Methods Engineer.*

Third Year.	*Fourth Year.*	*Fifth Year.*
Foundry services; re-search, and drawing office (methods).	Continuation as third year.	Specialization.

Technical College.
Final City & Guilds Certificates in Foundry Practice and Pattern-making.

(c) *Metallurgist.*

Third Year.	*Fourth Year.*	*Fifth Year.*
Routine chemical analysis Sand testing Furnace operation Foundry instruments Chemical research Physical testing. Special testing (ultrasonic, X-ray and high- and low-temperature testing).	Continuation as third year.	Specialization.

Technical College.
Ordinary National Certificate in metallurgy.

Technical College.
Higher National Certificate in metallurgy.

★ ★ ★ ★

F. H. Lloyd's Gala Day

"Something for everybody, among employees, their wives, sons and daughters," might well have been the basic theme of the very successful horticultural show, sports and gala, staged by F. H. Lloyd & Company, Limited (steelfounders and engineers) last Saturday. Fine weather graced the occasion, though one received the impression that affairs would have gone well had it been wet—so large was the accommodation in the several marquees erected on the firm's sports ground at Wednesbury for the occasion. Sideshows, competitive sports, a variety performance, mannequin parade and a photographic section were among the dozens of hobbies, pastimes and recreations catered for. There was even a narrow-gauge railway ride for children, pulled by a model steam locomotive built by the apprentices. Although exhibits in the garden-produce section were numerically smaller than in previous years, the quality was good despite the dry, hot summer which has made an end-of-season show less rewarding than usual. From auction sales, entrance fees, etc., the whole series of events realized a considerable profit which as in previous years, will be devoted to charity. Winners in the works departmental events were the light fettling department. Mr. S. Berry (heavy fettling department) received the award for the highest number of points gained by an employee, and Mr. E. L. Stokes (light fettling) that for the second highest. Prizes were distributed by Mr. F. N. Lloyd.

Standard's sell Tractor Plant

Stockholders of the Standard Motor Company, Limited, have approved a board proposal to sell the tractor plant to Massey-Ferguson, Limited, for nearly £18,000,000. There was only one dissentient for a resolution recommending the sale of the tractor factory's capital assets for £14,900,000, plus about £2,750,000 for stock, work-in-progress, and spare parts, which was put to a crowded extra-ordinary meeting at Coventry recently.

The Standard company's cash resources are expected to be augmented by about £12,500,000, of which about £4,000,000 will be distributed, tax free, to ordinary stockholders as a distribution of 2s. 6d. per 5s. stock unit. The remainder will be used on the company's car expansion programme. The meeting also approved the change in the company's name to Standard-Triumph International, Limited.

Murex Extend Activities

Due to substantial extensions at the Waltham Cross Works by Murex, Limited, metallurgists, manufacturers of high-grade ferro-alloys, etc., of Rainham (Essex), expenditure is likely to continue at an annual rate of £500,000, states the chairman, Sir Arthur Smout. Provision is to be made at Waltham Cross for the manufacture and assembly of automatic welding machines as well as for the extension of present activities.

Present indications are that capital expenditure will be met from trading surpluses and the accommodation made available by the company's transfers which it has not up to the present been necessary to utilize.

The opening months of the current year showed some improvement in demand and the general tone is better than it was at this time last year. Group net profits of £334,034 compared with £291,650 and the dividend is cut 2½ per cent. to 15 per cent.

Company News

QUALCAST, LIMITED, light repetition steel and iron founders and lawn-mower manufacturers, of Derby—There is to be a one-for-10 scrip issue to holders of September 28.

BROWN BROS., LIMITED, stockholders of ferrous and non-ferrous metals, etc., of London, E.C.2—The 1959 interim dividend is being raised to 4½ (3½) per cent. The final for 1958 was 11½ per cent.

CRAVEN BROS. (MANCHESTER), LIMITED, machine-tool manufacturers, etc., of Reddish, near Stockport—The interim dividend is restored to 5 per cent. from the 3½ per cent. paid in 1958, when the total payment was 10 per cent., compared with 7½ per cent. in 1957.

NORTH BRITISH LOCOMOTIVE COMPANY, LIMITED—There are no dividends on the 5 per cent. cumulative preference and 5 per cent. "A" cumulative preference stocks. Preference are in arrear from January 1, 1956; the "A" ranked for dividend as from January 1, 1959.

SMITH & WELLSTOOD, LIMITED, stove, range, and catering equipment manufacturers, of Bonnybridge (Stirlingshire)—Final dividend is 8 per cent., making 10½ (9) per cent. for the year ended June 30, 1959. Group net profit is £69,310 (£68,251), after tax of £61,351 (£76,520).

JOHN THOMPSON, LIMITED, makers of boilers, nuclear-power plant, steel pressings, etc., of Wolverhampton—An interim of 7½ (10) per cent. is declared for 1959 on capital increased by the acquisition of Thompson Bros. (Bilston), Limited. Orders secured in the earlier part of the year were considerably below those for the same period of 1958. Welcome signs of an improving trend in orders may not affect the final results for 1959.

MODERN ENGINEERING MACHINE TOOLS, LIMITED—The dividend is effectively maintained at 24 per cent. with a 12 per cent. final for the year to March 31, 1959. The 1957-58 total included a special interim dividend of 8 per cent. A scrip issue of one 7½ per cent. preference £1 share for every 10 ordinary 5s. units is proposed. Trading profit rose to £182,542 (£119,986) and after tax of £75,531 (£60,960) the group net profit is £69,147 (£31,668).

F. W. BERK & COMPANY, LIMITED, chemical manufacturers, etc., of London, W.1—The interim dividend is being raised to 3¼ (2 11/12) per cent. on account of 1959. The directors state that although the results for the first half of the current year indicate that the year's profit will be higher than last year, the increase in the interim does not necessarily imply an increase in the final. The 1958 final of 7 1/12 per cent. made a total of 10 per cent. for the year.

OXFORD & COWLEY IRONWORKS, LIMITED—The company's share capital has been purchased by British Automatic Refrigerators, Limited, Rotherham (Yorks). Mr. Frank Clark, managing director, states that the financial backing of the new parent company will enable the ironworks to extend its present 4½-acre site at Cowley and introduce a wider range of constructional steelwork and welded fabrications. The new board will be headed by Sir Leonard Dyer, chairman of British Automatic Refrigerators.

Plastics Exhibition

A "Plastics 1959" Exhibition is being held in Düsseldorf from October 17 to 25, full details of which can be had from John E. Buck & Company, Limited, 47 Brewer Street, Piccadilly, London, W.1. The provisional list of exhibitors shows that about two dozen British firms have taken space.

Policy of W. G. Allen & Sons

Reduction in expenditure by the NCB, particularly during the current year from April 1, has been a serious matter for W. G. Allen & Sons (Tipton), Limited, colliery, light railway, and mechanical engineers, states the chairman, Mr. R. Hampshire. The company, however, continues to do a very substantial trade with the Coal Board and, while maintaining its position in the mining field, is following a policy of diversification of products and interests, both by the acquisition of subsidiaries in different fields and also by the development of new products by the parent company.

Trade in the engineering industry has been much more buoyant in recent months with many more inquiries so that a smaller order-book is much healthier than the 12 months' delivery which so often had to be quoted in the days of the sellers' market.

Trade investments rose from £2,206 to £82,206, the increase representing the investment in the ordinary shares of Brockhouse Allen (Pvt.), Limited, in Rhodesia. The bank overdraft has been reduced to £83,035 (£115,339). Group net profit is £58,160 (£52,525) and the dividend is raised 2½ per cent. to 15 per cent.

Associated British Engineering's Loss

Main reason for the adverse result reported by Associated British Engineering, Limited, holding company for a number of engineering concerns, is the continuation of the heavy losses incurred by a principal subsidiary in the automotive and industrial division. Although the marine division has earned and is expected to continue to earn reasonable profits during the current year no improvement in the group's consolidated earnings can be foreseen until the losses referred to have been overcome. The group's project for the manufacture of free piston gasifyers for land and marine use is not at the present time producing orders on the scale originally envisaged.

In the year ended March 31, 1959, a trading deficit of £11,406 was incurred, against a previous surplus of £282,475 and there is no dividend on the £1,100,000 ordinary shares. For the previous year there was a 2½ per cent. interim but no final payment. The group net loss is £99,251 (profit of £30,227).

Wellman Smith Owen's Outlook

Capital expenditure programme, amounting in the last four years to about £1,000,000, has enabled the Wellman Smith Owen Engineering Corporation, Limited, London, S.W.1, to shorten delivery periods materially, states the chairman, Sir Peter Roberts, in his annual review. The company has a substantial order-book, work in progress, after £6,274,910 (£4,411,245) received, having increased from £426,996 to £963,169 at March 31, 1959.

There is a large volume of business in prospect from the iron and steel industry and contracts in hand extend well into 1961. Trading profit expanded from £890,269 to £1,398,208, reflecting record turnover and expansion of the business. The net profit rose to £633,471 (£396,395) and the dividend is effectively doubled at 25 per cent.

POWELL DUFFRYN CARBON PRODUCTS, LIMITED—Mr. F. W. Stokes has been appointed to the board. He joined the company in 1951 and was appointed works manager in 1954.

Institute of Indian Foundrymen

Annual General Meeting Report

The ninth annual general meeting of the Institute of Indian Foundrymen was inaugurated by the hon. Sardar Swaran Singh, Union Minister for Steel, Mines & Fuel, Government of India at the India Exchange Place, Calcutta, in July, when Dr. B. R. Nijhawan, PH.D., F.I.M., F.N.I., director, National Metallurgical Laboratory and the president-elect of the year was inducted into office. More than 150 members attended the meeting at which were considered the immediate steps to be taken to promote the foundry industry in the context of Government of India's current plans and production targets. The function was followed by the Institute's annual dinner at the Great Eastern Hotel which was attended by a record number of members and guests. The hon. Sardar Swaran Singh was the guest of honour at the dinner.

In his presidential address, Dr. B. R. Nijhawan thanked the members of the Institute for having elected him the president of the Institute, and assured them that he would do his utmost to further the interest of the Institute.

Outlining briefly the role of the Institute, Dr. Nijhawan said that he was proud of the diverse activities of the Institute since its inception in 1951 and its election as a member of the International Committee of the Foundry Technical Association, the first in Asia to be affiliated to that international body. To foster interest and to promote research and development in foundry technology by original technical contributions from industry, research laboratories and universities, Dr. Nijhawan announced the institution of four awards in gold medals and cash prizes, for outstanding contributions in various fields of foundry technology.

To cope up with the multifarious expansion of the Institute's activities, Dr. Nijhawan announced that steps were being taken to open chapters at important industrial centres in India, so that the foundrymen all over the country could have a forum for the presentation of technical results, views and opinion, and also assist in development work on foundry problems.

Indian Foundry Industry

Surveying the present position of the foundry industry in India and its future plans for expansion, Dr. Nijhawan stated that in the light of the developments that had taken place in the world in all phases of foundry technology, considerable scope existed for the growth and development of Indian foundries by adopting the latest techniques. The technical data provided by systematic investigations undertaken by the National Metallurgical Laboratory on the indigenous moulding materials, Dr. Nijhawan hoped, would go a long way in meeting the requirements of the foundry industry. Such investigations conducted by the Laboratory, Dr. Nijhawan added, had already paved the way for the introduction of sand-control systems into Indian foundries and a number of modern plants, such as that of the Tata Locomotive & Engineering Company, had already set up units for rigid scientific and sand-testing control and also for the reclamation of foundry sands.

With a view to assisting small, medium, and large-scale foundries, the president announced that the metals committee of the Council of Scientific and Industrial Research, under the chairmanship of Sir J. J. Ghandy, chairman of the Executive Council of the National Metallurgical Laboratory and director-in-charge of Tata Industries, Limited, had proposed to establish co-operative foundry research centres in selected areas in India. These foundry research stations would undertake short- and long-term problems, and impart technical "know-how" on the latest developments for increasing productivity and ensure economy and efficient operation for improving the quality of the products. The establishment of a training institute, Dr. Nijhawan said, would be necessary and in this connection he commended the proposal of All India Technical Education to establish an Indian Foundry College along the lines of the National Foundry College of Wolverhampton. He hoped that it would be possible in the near future to provide the industry with technical personnel, trained on scientific lines, for taking up higher executive, operational and managerial positions to cope with the rapid technical advances made all over the world.

Concluding his address, the president assured the Institute of his fullest co-operation and that of the National Metallurgical Laboratory in the pursuit of the objectives of this young but dynamic Institute. With the co-operation of members, he hoped that the Institute of Indian Foundrymen would continue to expand its activities and would acquire a stature at par with identical institutes in other advanced countries of the world.

Briefly reviewing the activities of the Institute, the retiring president, Mr. N. G. Chakrabarti, works manager, foundry division, Tata Locomotive & Engineering Company, said that the untiring effort of the Institute had resulted in starting a foundrymen's training centre at the Indian Institute of Technology, Kharagpur, in collaboration with the Ministry of Commerce and Industry, and the Ministry of Education and Technical Co-operation Mission in India. He said that over 100 foundry operatives had been trained already and were giving useful services to their respective foundries. He expressed the hope that, those trained in the Institute, would be able to contribute their part in the ever-expanding foundry industry in the country which, he was sure, would also have great scope in future.

School-leavers account for Rise in Unemployed

Young people leaving school accounted entirely for the rise in the number of unemployed by 32,000 to 427,000 between July 13 and August 17. Adult unemployment fell by 6,000. For the first time since February the number of unfilled vacancies declined. At 263,000 it was 12,000 lower than in July—though there was a fall of exactly the same dimensions in the same month of last year and the grand total is now over 60,000 higher than it was then.

The national percentage rose from 1.8 on July 13 to 2.0 on August 17. Regional percentages were lower than the national figure in London and the south-east (1.1), eastern and southern (1.3), south-western (1.7), Midland (1.5), north Midland (1.5), and East and West Ridings (1.7). Higher-than-national percentages were recorded in the following regions:—North-western (2.5), northern (3.1), Wales (3.4), and Scotland (3.9). Scotland was the only region which showed a fall in unemployment.

Mr. P. WARDEN, a former manager of the drawing offices of the British Thomson-Houston Company, Limited, at Rugby and Coventry, has died at the age of 71. He had been associated with the firm since 1902.

Equipment & Supplies

Micro-hardness Tester

Nash & Thompson, Limited, Chessington, Surrey, England (Elmbridge 5252), announce that they have concluded arrangements for the marketing of the G.K.N. micro-hardness tester, manufactured by Associated Automation, Limited, Dudden Hill Lane, London, N.W.10 This precision measuring instrument, which was developed by Associated Automation, Limited, and the Guest, Keen & Nettlefold research laboratories, enables indentations to be spaced less than 0.001-in. apart. Small sections, foils and individual crystals or phases can all be examined. Using a 10-gram load on a material with a hardness of 200 V.P.N. the diagonal dimension of the indentation is only approximately 10 microns. The micro-hardness tester can be supplied mounted to, and calibrated with, a suitable bench-type metallurgical microscope.

Cupola-blast Indicator and Controller

John Thompson Instrument Company, Limited, Ettingshall, Wolverhampton, are marketing a new cupola-blast indicator. This instrument is for the measurement of air pressure and air flow, and gives immediate warning of any divergence from normal, such as bridging, or too-deep or too-shallow a coke bed. The standard instrument (see Fig. 1) has a graduated circular scale of 20 in. effective length, with two pointers. The centre pointer indicates the air flow in cub. ft. per min., and the outer one shows air-pressure supply in the wind belt. It is housed in an aluminium casing to British Standard recommendations, and is of the flush-mounting type, being dust-proof and easily installed in a position suitable for observation by the cupola operator.

Optional Extras

There are a number of optional additions available for the basic instrument, one being an automatic damper control which regulates the oxygen feed to provide complete combustion at optimum conditions. Another extra is a blow-down attachment, which is put into operation by push-button after the last charge has been made. A third addition is an instrument for providing permanent records of each run, in which there is a two-pen recorder (see Fig. 1 (left)) which plots a complete record of air pressure and air measurement throughout the blow.

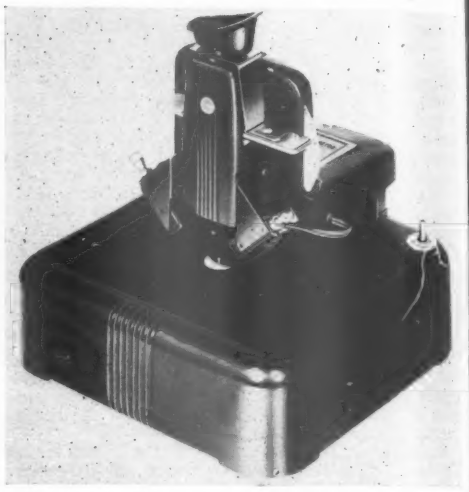


FIG. 2.—*Reflection-transmission colour densitometer, introduced by Kodak, Limited, of London.*

Colour Densitometer

Kodak, Limited, Kingsway, London, W.C.2, have introduced a new reflection-transmission colour densitometer (Fig. 2), which is designed for reading either transmission or reflection densities. Apart from its use in colour photography, the densitometer is reported to be useful in black-and-white work, where it can be used in the following ways: to determine the density range of prints, transparencies and negatives; to determine the paper grade to match the negative; to check exposure and development times; to help in predicting enlarging or contact-printing times; to check filter factors; to help in the preparation of time-gamma tables, and to check the activity of developing baths. It can also be used in density measurements of radiation monitoring films, control strips for X-ray film automatic processing units, and radiographs of step wedges.

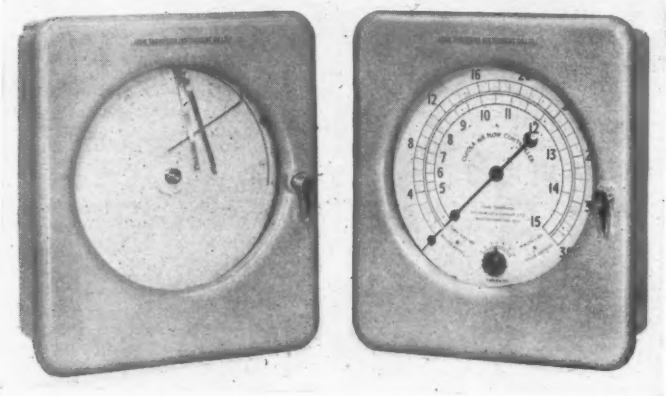


FIG. 1.—*Two models of the cupola-blast indicator and recorder now being marketed by John Thompson Instrument Company, Limited, of Wolverhampton.*

Pressure Indicator

The latest addition to the range of diesel-engine service equipment manufactured by the Dunedin Engineering Company, Limited, 73/75, Mortimer Street, London, W.1, is an instrument called a Diesindicator. It has been designed to register accurate peak and initial cylinder pressures upon a clear dial-type gauge, and provides immediate visual readings

without the need for making complicated adjustments before or during use. It is suitable for diesel engines of all speeds where access to the combustion chamber is provided; it is applied simply and quickly and can be used either in vertical or horizontal positions. The Diesindicator is supplied in a polished wooden instrument-case, complete with male and female connectors for standard compression cocks, special spanners and spares, and cleaning wires required for servicing the valve cartridge.

Fuel for Die-casting

Reporting on the merits of towns' gas as a fuel for die-casting purposes, the Gas Council, from 1, Grosvenor Place, London, S.W.1, has submitted the following account of the operations of a London firm—T.A.L. Developments, Limited. This firm, which was formed in 1945 with a small factory and a labour strength of six, now has 120 employees working in a factory of 20,000 sq. ft. The growth of the firm reflects the growth of the diecasting industry in Britain since the pre-war years. For example, the firm has increased its turnover almost threefold in the last five years, and to-day there is variety in plenty of production at the works in Tottenham. Among the larger zinc-base pressure-die-cast components made are headlamp bezels for the Ford Motor Company—these are of a complicated design, and have to be eventually chromium-plated. To avoid rejects, it is essential that the surface quality of the die-castings be of a very high order. Carburettor parts afford examples of a complex die-casting technique where the process has minimized machining and drilling costs to a considerable extent. At the other end of the scale are cases for ladies' watches, weighing only a few grams, and amongst other items are gold-plated zinc-base die-castings for electric shavers, components for the electrical and radio industries, and washing-machine components.

Approach to Automation

Some of the die-casting machines employed are manufacturers' standard models (Fig. 3); others have been built or modified by the firm themselves for their own use to meet special conditions or different contracts. The basic process of pressure-die-casting is well known—with zinc-base alloys, the metal is melted in a furnace and pumped under high pressure into a steel die, which forms the component to the shape of the die. Air valves open and close the die whilst operating the pump in a sequence, so that the whole process takes place on a controlled temperature/time schedule. Such machines are built for relatively large, complicated diecastings. On the other hand, when it comes to long runs of relatively small die-castings, a nearer approach to automation is desirable. For this the firm decided to build a number of completely automatic machines. They designed an electronic timer which, by operating the air valves automatically, opened the die-halves, closed them, allowed molten metal to flow into the cavity, then opened them again and ejected the casting without any action by the operator. A counting mechanism on the electronic timer told the operative precisely how many components had been turned out.

Control

The firm use gas for die-casting—first because of its convenience and second because of its reliability. "It also means that we have a quite simple form of costing," states Mr. M. C. Aldridge, who is one of the three partners who started the business, and who is now secretary and director. "From a meter reading we can keep a close check on the fuel cost per unit of output. And, of course, we know monthly or weekly fuel figures without having to attempt to determine how much solid fuel there is in a heap in the yard, or how much liquid fuel there is in a tank." The firm not only specializes in zinc-base die-castings, they also make considerable quantities of pressure-die-cast aluminium-alloy castings. The process here is somewhat different, the aluminium alloy being separately heated in non-metallic crucibles, again on pyrometer control principles, and then ladled in the molten state into the die-casting machines.

FIG. 3.—*Die-casting machine in the "dies-open" position, showing the die cavity—at the works of T.A.L. Developments, Limited.*

METALIFE GROUP OF COMPANIES, Station Square, Harrogate, announce a recent addition, "Metalife 1000," to their range of rust-proofing and corrosion-resisting liquid metals for the protection of iron and steel. It is claimed that this coating will withstand temperatures up to 535 deg. C. A possible use suggested by the makers is the coating of cupolas and ovens.

WITH A RECENT ORDER for two 5,000 cub. ft. per hr. nitrogen plants, the gas atmospheres division of the Incandescent Heat Company, Limited, Smethwick, Birmingham, has now installed or has on order 50 nitrogen plants with capacities ranging from 500 to 32,000 cub. ft. per hr. at NTP. The majority of these plants are packaged units and can be transported in one piece. These plants all depend on the combustion of gaseous or liquid fuel with air so that atmospheric oxygen is converted to CO_2 and H_2O. The water is removed by cooling, refrigeration and desiccant drying, whilst scrubbing with monoethanolamine removes CO_2. Complete removal of H_2, CO_2 and O_2 is accomplished by a unique process which depends upon the use of a special catalyst. Another feature claimed for these generators is a high degree of flexibility, since the flow of amine, fuel gas and air are all related to the demand for nitrogen. It is reported that the resultant nitrogen has a purity equivalent to that obtained by any other method.

Nucleation of Grey Iron

"Some Methods of reducing the Degree of Nucleation of a Grey Cast Iron in Relation to Sinking under Bosses on Thin Plates" is the title of a Research Report (No. 512) contained in the June issue of the British Cast Iron Research Association's *Journal of Research and Development*. The author, Mr. A. G. Fuller, B.SC., states that experiments carried out in this work show that sinking and the degree of nucleation of a grey cast iron may be reduced by the following processes:—(1) Bubbling oxygen through the furnace for two minutes; (2) poling with a green pole; (3) holding the molten metal in the furnace at temperature and (4) additions to the furnace of titanium with or without subsequent bubbling with carbon dioxide.

In his introduction to the Report, the author states that repeated observations have shown that the depth of sinking under bosses on thin plates is related to the number of eutectic cells growing. One of the most important factors controlling the number of eutectic cells growing is the degree of nucleation of the iron. The purpose of the investigation was to investigate processes by which the degree of nucleation may be reduced, since, due to the fact that the degree of nucleation of a cupola melted iron may vary widely during the course of a day, it may be desirable to maintain some control over this variable. In this investigation no attempt was made to demonstrate methods by which the degree of nucleation may be increased, since inoculation is the most suitable process and its effect on decreasing soundness and increasing the degree of nucleation has previously been demonstrated.

Conclusions from Tests

A number of tests were carried out by casting $\frac{5}{16}$-in. plates measuring 9 by 6 in. from metal melted in a high-frequency furnace, and cast into green-sand moulds based on Broomsgrove red sand carrying six per cent. superfine coal-dust and five per cent. moisture. The author gives his views on the tests in the following statement:—

From previous experience it has been found that the degree of nucleation and the shrinkage characteristics of a cupola melted iron are greater than of irons melted in a high-frequency induction furnace. For this reason, throughout the series of experiments described in the paper, the metal was inoculated prior to any treatment, in order to make it more representative of cupola melted iron, since the object of this experiment was to investigate some of the methods available for reducing the degree of nucleation of an iron in a commercial foundry.

Due to limitations upon the equipment available in the laboratory, the effect of holding time on reducing the degree of nucleation was assessed by holding the metal in the high-frequency melting furnace. This is not likely to be practicable in a commercial foundry, particularly where the metal is melted in a cupola, but experience has shown that the degree of nucleation may also be reduced by holding the metal in a receiver, bull ladle, or even in the casting ladle, provided that the temperature fall during the holding period is not too great.

The success of the gas-bubbling treatments and of poling in reducing the degree of nucleation is believed to be due to their effect in causing turbulence in the metal. Although bubbling oxygen through the metal and poling with a green pole are employed in some sections of the industry as methods for increasing the chilling characteristics of the iron, it is believed that in practice any method of causing turbulence will be satisfactory and that in most foundries compressed air is likely to be the most readily available means. The next stage of this investigation will preferably be the examination of these methods in a foundry, in which it is desired to obtain some form of control of the degree of nucleation, but in the meantime further laboratory experiments will be carried out using compressed air.

In all of the experiments in which gases have been bubbled through the molten metal, refractory lances have been used, since in preliminary experiments when using both graphite and refractory lances it was observed that whereas bubbling with oxygen through a graphite lance increased both sinking and the degree of nucleation of the iron, reverse effects were obtained if a refractory lance was used.

In applying in the foundry any of the processes described in the paper it must be remembered that while a decrease in the degree of nucleation of the iron will improve the soundness of light-sectioned grey-iron castings, a number of side effects may occur, for example, a reduction in the mechanical properties of the iron, an increase in the chilling tendency of the iron, and the occurrence of phosphide or other exudation defects upon the casting. The side effects may in certain circumstances be undesirable and in these circumstances deliberate reductions in the degree of nucleation should be carried out only under closely controlled conditions.

Edgar Allen oppose Steel Nationalization

On the subject of nationalization of the steel industry, Mr. W. H. Higginbotham, chairman of Edgar Allen & Company, Limited, Sheffield steelmakers, in his annual review states: "We can only hope that the general public will be wise and well informed enough in due time, to reject such a policy decisively. Meanwhile, your directors feel it to be their duty, in your interests, to oppose it by every legal and practicable means."

The general picture is one of recovery and progress, the chairman says, and though the board reports signs of improvement in demand, it is unlikely to come quickly enough to benefit the current year very materially. Group net profit contracted to £258,880 (£375,746) and the dividend is maintained at 12½ per cent.

Newton Chambers and the Master Cutler

MR. P. J. C. BOVILL, B.SC., who has been elected the 324th Master Cutler, is managing director of Newton Chambers & Company, Limited, Thorncliffe, Sheffield, ironfounders and engineers. He is also a director of Ransomes & Rapier, Limited, of Ipswich, and Wellman Smith Owen Engineering Corporation, Limited, Darlaston. He is a member of the Court of Governors of Sheffield University, a member of the council of Sheffield Chamber of Commerce, and a vice-president and past-president of the National Trades Technical Societies. It is interesting to note that Newton Chambers have a unique record of Masters of the ancient Company of Cutlers in Hallamshire. Three members of the present board of directors are past Master Cutlers—the chairman, Sir Peter Roberts, BT., M.P. (1956); Col. J. P. Hunt (1948); and Lord Riverdale (1946). In addition, Sir Harold West, former managing director, was Master in 1952; and the late Sir Samuel Roberts, BT., a former chairman, was Master Cutler in 1935.

Notes from the Branches

South Africa

A paper entitled, "Pyrometry—The Science of High Temperature Measurement" presented by Mr. P. F. A. Robinson, launched the general meetings for the new presidential year of the South African branch of the Institute of British Foundrymen under the chairmanship of Mr. K. H. Coombs. The author introduced his lecture by informing members that pyrometry had been defined by the Association of Scientific Apparatus Manufacturers as the art of temperature measurement above 500 deg. C. He also stated that it is doubtful if the immense development in melting, casting and wrought fabrication of iron and steel would have been possible were it not for the improvements in the methods of measuring hot-steel temperatures, both molten and solid. The basic principles of the various types of pyrometers were broadly classified into resistance thermometers, thermocouples, partial-radiation and total-radiation pyrometers.

Resistance Thermometer

The resistance thermometer is generally only used for accurate research work, although it can be used in industry for the measurement of temperatures below 600 deg. C. This type of thermometer gives the greatest accuracy of all secondary instruments, but is extremely delicate and bulky, and for these reasons is not used extensively in industrial applications. One possible use is for furnace-temperature measurements in low-temperature annealing operations.

Thermo-electric Pyrometry

A thermocouple pyrometer consists of three main elements:

(*a*) The thermocouple, comprising two dissimilar metals, usually wires, electrical insulation, and usually a protection tube.

(*b*) Lead wires to connect the thermocouple and the instrument.

(*c*) An e.m.f.-measuring instrument, usually a potentiometer or millivoltmeter.

The copper/constantan (45 per cent. nickel, 55 per cent. copper) and iron/constantan couples have been developed for low-temperature work in the sub-zero to 500 deg. C. range. Chromel (90 per cent. nickel, 10 per cent. chromium)/Alumel (94 per cent. nickel, 2 per cent. aluminium, 3 per cent. manganese, 1 per cent. silicon) thermocouples have a straight temperature/e.m.f. curve up to near the maximum of 1,300 deg. C. Since this combination of alloys can be used continuously up to 1,110 deg. C., and are very cheap, they are extensively used for recording the temperatures of heat-treatment furnaces.

Quick Immersion Thermocouple

The Q.I.T. consists of a Pt./Pt.-Rh. thermocouple protected by a vitreous silica sheath of such thickness as to withstand the pressure of the liquid metal, but thin enough to allow the hot junction of the couple to attain the temperature of the bath in a few seconds. Reliable routine measurements of temperatures of the order of 1,600 deg. C. can be made with this unit. The silica sheaths should be renewed after each immersion, and after 10 to 12 readings an inch or so of the thermocouple wires should be removed and a new hot junction made. The quick-immersion thermocouple is extensively used in the iron and steel industry.

Total-radiation Pyrometer

In the total radiation type of pyrometer a convex lens or concave mirror concentrates a fraction of the radiation from the test body on to a sensitive element, which has a blackened receiving surface. This receiving element is generally a sensitive thermocouple, and the resultant e.m.f. may be measured by means of a millivoltmeter. Both fixed-focus and variable-focus instruments are in general use, the former being used extensively for roof-temperature measurement of open-hearth furnaces.

Optical Pyrometer

The optical pyrometer is a partial-radiation pyrometer, and may be regarded as an instrument designed to improve the visual estimates of temperature by providing the eye with a lamp filament. This filament is connected in series with a battery, resistor and milliammeter. By varying the current through the filament it may be made to match in brightness the image of the hot body.

Discussion and Vote of Thanks

The discussion was opened with a contribution by Mr. E. Beaver, who discussed the care and maintenance of pyrometric equipment. He emphasized that common-sense, care, and simple routine checks would be well rewarded in maintaining a high degree of accuracy, reliability and usefulness from all pyrometric equipment. The vote of thanks was proposed by Mr. Gordon Jones, who said that the paper had been a valuable contribution to the branch's knowledge of this important subject, and that he found the discussion most refreshing. The vote of thanks was acclaimed with cordiality.

New Catalogues

Ventilation. Two catalogues have been received from Templewood Hawksley—a member of the Hawker Siddeley group—2, Buckingham Avenue, Slough, Bucks. The first deals with roof-slope aluminium cowl-type extractors. Aluminium, it is stated, is to be preferred to steel for this duty owing to its superior corrosion resistance, but steel units carrying a protective coating can be supplied, to suit any specific conditions for which aluminium is not suitable. The catalogue carries some quite interesting calculations of the number of units required to change the atmosphere of a building six times per hour. The second catalogue covers power-operated roofing shutters (details of these were given in the JOURNAL, January 29 issue, page 127).

Epoxy-resin Adhesives. Ciba (A.R.L.), Limited, Duxford, Cambridge, have recently issued a very useful folder on how to use Araldite epoxy-resin adhesives. It takes the form of two charts, the first of which lists the materials to be joined and about 16 types of adhesives and then indicates the results to be expected from their application. The second chart details comparisons of these adhesives and some useful practical hints are also given as to their applications.

Blast-furnace Linings. In Publication No. 116, General Refractories, Limited, Genefax House, Sheffield 10, have made good use of colour printing to stress the company's recommendations as to the type of refractory to be used in all parts of blast-furnaces and hot-blast stoves.

Pointers from Japan

Research by a Tokyo University

The Castings Research Laboratory of Waseda University, Tokyo, Japan, have issued a report (No. 9) which contains a number of very interesting observations. Some of these are summarized in what follows.

In a paper on the "Influence of Vacuum Melting on the Structure and Mechanical Properties of Cast-iron" by Dr. I. Iitaka and M. Kiruchi, it is shown that the various treatments, such as atmospheric melting and casting in vacuum; melting in vacuum and casting in atmosphere; melting and casting in vacuum; melting in vacuum and casting in nitrogen, and vacuum-melting and casting in argon, all progressively increase the tensile strength of the iron, and finally doubling it as compared with normal practice. The reaction austenite→graphite + ferrite was found to be promoted by vacuum-melting, and massive graphite to be separated out by vacuum-melting.

Dr. N. Kayama, T. Ishino and K. Saito in a paper on the "Effect of Moisture on Molten Cast-iron," describe the results of tests on the blowing of air on iron heated to 1,000 deg. C., and on molten iron at 1,400 deg. C. It was found that the considerable oxidation noted in the former case was inappreciable in the second. The authors deduced that the major adverse effect in cupola practice took place before actual fusion. They suggest that, due to the moisture in the coke and furnace lining (which is additional to the atmospheric moisture), the water content in cupola practice is actually higher than usually suspected, and that increased chilling and shrinkage cavities therefore result.

Experiments using both a small cupola and an electric furnace are described in a paper, by Dr. I. Iitaka and K. Nakamura, covering the various properties of high-duty cast-iron consequent upon an oxygen blow. The results yielded show only a slight improvement on those given by using steel scrap additions, all melts being inoculated with a 0.3 per cent. calcium silicide addition.

In a paper from T. Kusakawa, dealing with s.-g iron, examination is made of the fundamental properties of calcium, magnesium and cerium. It is recommended that calcium and cerium be used as a combined addition.

Non-ferrous Papers

"Melt Quality and Fracture Characteristics of 85/5/5/5 Red Brass" is the subject of a report by S. Oya and U. Honma, where an attempt was made to establish more quantitative correlations between gas pick-up and fracture characteristics. It appears from these studies that "little gas pick-up can occur by water vapour bubbling through the 85/5/5/5 melt without any deoxidizer, but marked pick-up can be expected from water-vapour bubbling or exposing, following an excess addition of phosphor copper. Fracture characteristics of the chilled blocks are susceptible to gas pick-up in the melt. Less depths of columnar (structure), blue-grey patterns, and coarser texture are formed in the fractures from high gas-content melts. When the gaseous melt is settled (held) for 10 min. or more, dissolved gas in the melt attains equilibrium."

These two authors carried out a similar research on "Gases in Aluminium-bronzes." The alloy used was 87-per cent. copper; 10-per cent. aluminium and 3-per cent. iron. There was very little gas pick-up after bubbling of water vapour, prolonged stewing and excessive heating of the melt. Serious gas pick-up occurred after a 0.2-per cent. Ca addition to the melt

(*Continued at foot of Col.* 2)

followed by steam bubbling. High casting temperature can influence density and porosity, as also can prolonged holding time after gas pick-up.

Dr. J. Kashima and H. Miyasaka, in a paper on the "High-temperature Properties of CO_2 Sand" detail the effects of ten different additions on the compression strength and deformation of the sand, at temperatures ranging from room to 1,400 deg. C. The additions included: coal-tar pitch, Gilsonite, asphalt emulsion, wood-flour and bentonite.

Presentation to C. S. Whitfield

Following the appointment recently of Mr. C. S. Whitfield as foundry manager of Stanton Ironworks', Holwell Works, Melton Mowbray, he was made the recipient of presentations from the management and

employees at Stanton's Riddings Works, where he was previously superintendent. The illustration shows Mr. Whitfield (right) at an evening function receiving a silver cigarette case from Mr. T. K. Brook (office manager at Riddings), who made the presentation on behalf of his colleagues. (The transistor receiver, gift of Riddings employees, is shown in the foreground).

Zirconium Sponge Import Duty Exemption

The Board of Trade give notice that they are considering an application for the exemption from import duty of zirconium sponge. A statement of the applicants' case will be made available to all interested parties who wish to make representations in the matter if they are prepared to give an undertaking to treat the information contained therein as strictly confidential and to allow their comments to be passed to the applicants for reply. Requests for a statement of the case, together with an undertaking in the terms set out above, should be addressed in writing to the Board of Trade, Tariff Division, Horse Guards Avenue, London, S.W.1, not later than September 21.

Appleby-Frodingham Record

As the result of further technical progress, significant achievements in the production of steel during August are reported by the Appleby-Frodingham Steel Company (branch of the United Steel Companies, Limited), Scunthorpe (Lincs). The company's combined melting shops had a record output of 116,518 tons of steel during the four weeks ended August 29. This exceeds by nearly 12,000 tons the previous best four weeks' output of 16 months ago.

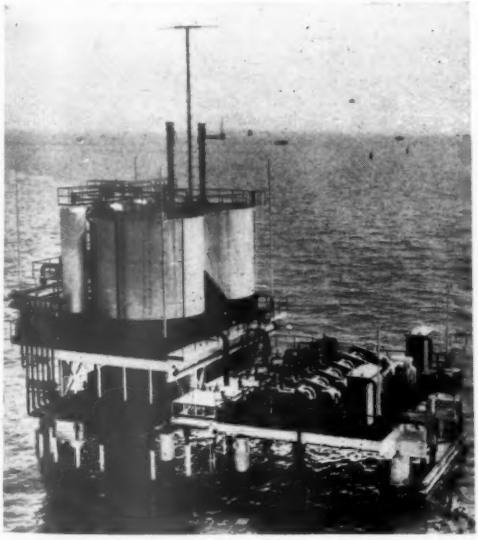
Included in the new output figure was the additional production record of the Appleby melting shop, which alone made 74,437 tons of steel. Its previous best four-week total was 70,383 tons achieved in December, 1957.

During the past four weeks the second open-hearth furnace, which has been converted to the "Ajax" oxygen process, stepped up output to 14,495 tons, an increase of 1,319 tons on the previous four weeks.

The process at Scunthorpe was designed by Appleby-Frodingham to give substantially higher outputs from existing open-hearth furnaces without incurring a heavy capital expenditure.

Armstrong Whitworth Pumps in Venezuela

The pumps shown in the accompanying illustration of an off-shore station, are being used for pumping oil from a Venezuelan lake. They have been manufactured by Armstrong Whitworth (Metal Industries), Limited, for the Oil Well Supply Company, Limited, and are of the 140-h.p. Oilwell-type 612-P, with a capacity of



8,100 gall. per hr. at 35 r.p.m. Shell Venezuela have so far purchased 100 of these pumps, and 70 of them are installed in the "block" units. Great care was needed in the manufacture of the high-duty cast-iron castings used, as they have to withstand 3,000 lb. per sq. in. pressures. Ultrasonic, gamma-ray and other non-destructive tests were applied during manufacture.

Safety Abstracts

Volume 3 number 32 of *Industrial Safety Abstracts*, compiled by the Institution of Industrial Safety Officers (52 Grosvenor Gardens, London, S.W.1), and published by the Royal Society for the Prevention of Accidents, contains several of interest to founders. For example, the abstract from "Problem of Rheumatism in Industry" reveals that among workers in metal manufacture, engineering and allied trades, the incidence of rheumatic diseases is below average; workers in mines and quarries top the list. Another, referring to "Health Problems of Epoxy Resins" contains the statement that experince has shown that it is now possible to avoid or reduce the health hazards of these materials by efficient factory techniques, and a list of 12 precautionary measures is quoted. These are:—

1. Instruction and education of all staff.
2. Only limited quantities of materials, particularly solvents, must be made available from stores. In practice this should be restricted to that amount necessary for the shift or at most for the day's work.
3. The routine technique should be adopted so that one complete cycle of operation takes place, *i.e.*, weighing, mixing and de-aerating, pouring, stoving.
4. Mixing and de-aerating should take place in well-ventilated chambers under cowling or in fume cupboards. Extraction fans must discharge to the outside air. Hot processes should be housed in a special unit. Where exhaust ventilation is not possible, fans of reasonable size should be installed to blow air away from the operator.
5. No smoking or consumption of food at work.
6. Benches should have easily cleaned surfaces or covers which can be changed when soiled.
7. For the cold- or air-cure process, work should be stored in well-ventilated chambers where restricted entry can be maintained.
8. Paper cups which are frequently used to mix resins must be disposed of to avoid further contamination, and are best destroyed by incineration outside the works.
9. Full advantage must be taken of industrial hygiene:
   (*a*) Suitable barrier-creams must be provided at the work bench and used regularly;
   (*b*) Resin-removing cream must be available at the work bench with a supply of clean rag or paper towels;
   (*c*) Protective clothing should be used and face-masks if powders are used. Sleeveless overalls avoid impregnation of cuffs;
   (*d*) Good washing facilities must be available on site.
10. Pre-employment selection of workers to exclude those with a history of chronic skin disease, allergy and asthma.
11. All skin involvements and injuries should be reported immediately.
12. Thorough cleansing of the hands before using lavatories.

The publication also contains abstracts of papers on such subjects as "Occupational Causes of Lung Cancer"; "Healthy Floor Coatings"; "Are Safety Campaigns Effective" and "Foundry Goggles"— the latter, of course, referring to the second report on this subject appearing in this JOURNAL last May.

ALFRED HERBERT, LIMITED—Sir Halford Reddish, chairman and managing director of the Rugby Portland Cement Company, Limited, and a director of the Hawker Siddeley Group, Limited, has been appointed a director. He will act in a consultative capacity.

Personal

Midland Silicones, Limited, announce that Mr. R. J. NEWTON has been appointed textile marketing manager.

Mr. T. FURNESS, secretary and a director of Thomas Robinson & Son, Limited, woodworking engineers, has been appointed a managing director.

Mr. JOHN P. ELLIOTT, F.I.C.S., secretary and a director of Davey, Paxman & Company, Limited, engineers, Standard Ironworks, Colchester, has been appointed assistant managing director.

Mr. I. LEVIN and Mr. A. L. WOLLEY have been elected directors of the General Steel & Iron Company, Limited, Hayes, Middlesex, and of G. R. Turton, Limited, engineers, Vulcan Ironworks, Nottingham.

Mr. J. C. SPARK, works manager of the locomotive works of Eastern Region, British Railways, at Doncaster, has been appointed works manager in charge of the combined locomotive, carriage and wagon works there.

After an interval of 25 years, Mr. ANDREW HAMILTON has rejoined the Paisley firm of Thomas Lamont & Company, marine-pump manufacturers, and will be responsible for their interests on the English north-east coast.

Mr. T. WALKER, formerly secretary of J. Haigh & Sons, Priestroyd Ironworks, Huddersfield, celebrated his golden wedding on September 4. Aged 77, Mr. Walker retired at the age of 70, having been secretary of the company for 37 years.

Sir PETER ROBERTS, chairman of Newton Chambers & Company, Limited, of Sheffield, will be guest of honour at the opening session of this year's Gas Sales & Service Conference, being run by the Gas Council at Harrogate on October 6 and 7.

Mr. A. C. BIRD has been appointed works manager of the roll foundry of Davy & United Roll Foundry, Limited, manufacturers of steel castings, etc., Empire Works, Billingham, Co. Durham, a subsidiary of the Davy & United Engineering Company, Limited, Darnall Works, Sheffield.

Mr. WILLIAM W. BROOKS, who has been appointed managing director of the Dorset Ironfoundry Company, Limited, and Difco, Limited, of West Quay Road, Poole, was formerly general manager and technical director of M. & W. Glazebrook, Limited, Dudley (general engineers and ironfounders).

Mr. D. C. M. SALT, director of sales, has been appointed alternate to Mr. J. W. URBAN on the board of Monsanto Chemicals, Limited. Mr. Salt, who joined Monsanto in 1935, was appointed general manager of sales in 1956 and, prior to his recent appointment, was general manager of chemicals division.

Mr. NORMAN READMAN, managing director of the Consolidated Pneumatic Tool Company, Limited, 232, Dawes Road, London, S.W.6, has been appointed chairman of Jacobs Manufacturing Company, Limited, and Frank Guylee & Son, Limited (both of Archer Tool Works, Sheffield), and also of the Reichdrill Manufacturing Company, Limited.

The inauguration of the new director of the Scientific Instrument Manufacturers Association of Great Britain, CAPTAIN ROBERT ALEXANDER VILLIERS, C.B.E., A.M.I.E.E., R.N. (RETD.), took place last week. Until recently he was United Kingdom naval representative with the NATO military agency for standardization and chairman of the Naval Board, in London.

Mr. W. E. JONES, O.B.E., who is president of the National Union of Mineworkers and a member of the General Council of the T.U.C., has been appointed to the Monopolies Commission as a part-time member. The appointment will be for a term of three years dating from September 1. Mr. Jones is replacing Mr. A. J. BIRCH who has recently retired from the Commission.

Mr. R. F. A. SAMPSON, a director of Newton Chambers & Company, Limited, presented the Sir Samuel Roberts Cup, the premier award, at the Thorncliffe Horticultural Society's Show at Chapeltown on August 29, to 76-year-old Mr. LIONEL TEASDALE, who retired earlier this year after being a moulder at Newton Chambers for 63 years. He won six first prizes, eight seconds and 12 thirds.

Mr. ERIC N. SIMONS, publicity manager of Edgar Allen & Company, Limited, Sheffield, is retiring from that post but is retained as publicity consultant to the firm. He also continues as Editor of the *Edgar Allen News* which he helped to found 40 years ago. Mr. ALAN B. JORDAN, of the National Gas & Oil Engine Company, Limited, has been appointed publicity manager in succession to Mr. Simons.

Mr. G. B. PERRY has been appointed managing director of Axia Fans, Limited, a member of the Hall-Thermotank group of companies. He has also been appointed a director of Vent Axia, Limited, and will retain his seat on the board of Thermotank, Limited, with which company he formerly held the executive posts of director, engineering division, and general manager of its international products division.

Mr. D. E. GRAHAM has been appointed managing director, and Mr. J. RIERA, Mr. C. A. T. BROWN and Mr. L. W. BELL, directors of James Archdale and Company, Limited, a subsidiary of the Staveley Coal & Iron Company, Limited, as from November 1. These appointments have been made in view of the advancing ages of Mr. FRED ARCHDALE, Mr. JAMES ARCHDALE, Mr. WILL ARCHDALE—who will, however, continue as full-time directors, for the time being—and to secure continuity of management.

Mr. HAROLD RIGGALL is to relinquish the position of managing director of Ruston & Hornsby, Limited, engineers, steel and iron founders, etc., of Lincoln, at the end of the year. Announcing this at the company's annual meeting in London on September 2, the chairman, Mr. W. J. Ruston, said that Mr. Riggall would remain on the board in a non-executive capacity as deputy chairman and would also remain chairman of Ruston & Hornsby (Australia) Proprietary, Limited. Mr. Riggall has been with the company since 1923. Mr. V. R. PREHN and Mr. GEOFFREY W. BONE have been appointed joint managing directors as from January 1, 1960. It was announced recently that Mr. Bone had assumed responsibility for the engineering policy of the company and its associate, Davey, Paxman & Company, Limited.

Obituary

Mr. A. EDGAR DICKINSON, managing director of Smith Bros. (Hyson Green), Limited, brassfounders, Bobbers Mill Road, Nottingham, has died at the age of 57. He was a member of the Nottingham Society of Engineers, and of numerous manufacturing organizations associated with engineering.

One of Australia's pioneers in the steel industry, Mr. ARTHUR SIDNEY HOSKINS, has died in Sydney, aged 67. He was a co-founder of Australian Iron and Steel, Limited, the principal subsidiary of Australia's largest industrial organization, Broken Hill Pty. Limited, and he began Australia's first successful large-scale steel industry at Lithgow, New South Wales.

News in Brief

THE RECENTLY ESTABLISHED Belgian subsidiary of the Pressed Steel Company, Limited, Cowley, Oxford —Pressed Steel S.A., Cantersteen 7, Galerie Ravenstein 30, Brussels 1—is now in full operation.

THE address of the Bristol branch office of the English Electric Company, Limited, is now Equity and Law Building, 36/38, Baldwin Street, Bristol, 1. The telephone number remains the same (Bristol 27304).

AS PART OF THE SCHEME for the electrification and modernization of British Railways, an order for 91 three-car electric trains has been placed with the Pressed Steel Company, Limited, Linwood, Renfrewshire.

E. STEPHENS & SON, LIMITED, metal workers and merchants, 58-66, Bath Street, London, E.C.1, have taken over the old-established iron foundry of D. A. Aston & Company, Bastwick Street, London, E.C.1, and will continue to run it with its present management and staff.

MORE THAN 90 PER CENT. of the 15,000 workers employed by Colvilles, Limited, Glasgow steelmakers, and its subsidiaries, have intimated willingness to participate in the firm's non-contributory pension and life-assurance scheme which came into operation on September 1.

YET ANOTHER FILM featuring a branch of the United Steel Companies, Limited, is to be made next month. This time it is the turn of the Appleby-Frodingham Steel Company, Scunthorpe (Lincs), and later a film is to be made of the United Coke & Chemicals Company, Limited, Sheffield.

W. C. HOLMES & COMPANY, LIMITED, Turnbridge, Huddersfield, taking cognisance of the report of the Cohen Council on prices, productivity and incomes, and having introduced line production of blowers, announce their intention of reducing the sales prices of these items. In one case, the reduction in price amounts to 19 per cent.

THE SPANISH STEELWORKS, Ferrerias del Ebro S.A., are to erect a plant at Miranda de Ebro in which will be installed two electric furnaces capable of giving a yearly output of 65,000 tons. Another Spanish concern, Nueva Montana Quijano of Santander, may in the near future make castings for the local production of Renault cars.

Mr. JOHN WIKELEY, engineer and surveyor to Chesterfield Rural Council, said at a meeting of the Council, that gas seeping through the soil in Pinfold Street, Eckington, was now known to be methane and experts were trying to discover the commercial possibilities. The sinking of a shallow bore hole to determine the extent of the gas was being considered.

GIDDINGS & LEWIS MACHINE TOOL COMPANY of Wisconsin, USA, which recently participated in the formation of Giddings & Lewis—Fraser, Limited, Arbroath, Scotland, have acquired an interest in Nassovia Maschinenfrabrik Hanns Fickert, near Frankfurt on Main, in Germany. It is in future to be known as Nassovia Werkzeugmaschinenfabrik G.m.b.H.

A FRENCH BRANCH OFFICE has been opened by Pollard Bearing Limited, Ferrybridge (Yorks). The address is:—Pollard-Roulements, 98, Rue Truffaut, Paris, 17e (telephone: MARcadet 09-10). A Montreal branch office is being opened by Canadian Pollard Bearings, Limited, Oakville (Ont), a Canadian associate company, at 623, Decarie Boulevard, Ville St. Laurent, PQ.

PLATT BROS. (SALES), LIMITED, Oldham, a subsidiary of Stone-Platt Industries, Limited, has secured a further order from the USSR. The contract is for woollen spinning machinery to the value of over £250,000. The whole of this equipment will be made at the Oldham factory of Platt Brothers & Company, Limited, and deliveries will commence at the end of this year.

COMPETITION of the Eastern block is making itself increasingly felt in many developing countries where the gap between expectations of capital assistance from Germany or Europe and funds actually available widened during the year, states the annual report of Ferrostaal, AG, the German iron and steel company. Invoiced deliveries in 1958 totalled about £63 million.

BETWEEN 70 AND 80 MEN will become redundant at the Pallion, Sunderland, factories of Bristol-Siddeley Engines, Limited, due to programme changes and the completion of certain contracts. The works employs 1,000 men, producing components for the Proteus, Orpheus, and Olympus gas-turbine engines. Further redundancy, on a smaller scale, may arise later in the year.

UNITED STEEL COMPANIES, LIMITED, Sheffield, have purchased a third aeroplane for the use of their executives at a cost of £30,000. It is a six-seater Italian Piaggio which is being added to their existing fleet of two aeroplanes to take executives from the firm's different centres on business trips. The group has operated its own aeroplanes for some years because of the great saving in time.

FOLLOWING THE MERGER between J. & E. Hall, Limited, the Dartford (Kent) ironfounders and engineers, and Thermotank, Limited, air-conditioning, heating and ventilating engineers, of Glasgow, a trading agreement which the latter company had with Woods of Colchester, Limited, has been discontinued. The agreement provided for the sale of Thermotank/Woods fans to the marine industry.

CHANGES IN THE wholesale inland selling prices of certain of the products of Shell-Mex & B.P., Limited, are announced. Gas-oil and marine-diesel fuel have been reduced in price by ½d. a gallon, while the price of light fuel-oil has been increased by ½d. a gallon and that of heavy fuel-oil by ½d. a gallon. A reduction of ½d. a gallon in the price of gas-oil is announced by the National Benzole Company, Limited.

FORD MOTOR COMPANY, LIMITED, has placed with Birlec, Limited, orders totalling some £75,000 for three gas-carburizing furnaces. The largest is a continuous furnace, to be heated by gas-fired radiant tubes, for carburizing transmission gears, and it is the third such furnace commissioned from Birlec by Fords. With a carburizing cycle of about 9½ hr., the furnace is designed to give an output of some 800 lb. per hour.

A ONE-DAY CONFERENCE for business executives, to be held on November 20, in the Royal Festival Hall, London, is to be addressed by nine eminent doctors who will speak on illnesses to which executives are susceptible. Tickets cost four guineas each and include morning coffee, luncheon (with wines), and tea. These are available from the Chest and Heart Association, Tavistock House North, Tavistock Square, London, W.C.1.

THE WEST RIDING OF YORKSHIRE BRANCH of the Institute of British Foundrymen is to hold a meeting on September 12, at 5.30 p.m., when Mr. H. W. Griffiths (president) has invited members to tea at 1, Mannville Terrace, Bradford, before proceeding to the Bradford Institute of Technology at 6.15 p.m. The evening's programme includes his Address and showing of the Samuel Osborn film "Socast Steel Castings."

News in Brief

A MEETING OF MEMBERS, in the Lancashire and Cheshire area, of the Association of Bronze & Brass Founders is to be held on September 22 at the Engineer's Club, Albert Square, Manchester, commencing (with tea) at 5.30 p.m. Following the members' meeting, there will be an "open" meeting at 6.30 p.m., when Mr. W. H. Davies will elaborate on the system advocated in the Association's publication "Costing a Casting."

A £100,900 AMERICAN CONTRACT for the manufacture of 200 tons of non-ferrous tubing has been secured by Serck Tubes, Limited of Greet, Birmingham. The contract is for brass and nickel tubing to be installed in a new power-station owned by the Tennessee Valley Authority. An official spokesman for the company said the closest competition came from other British firms and that American estimates were appreciably higher. Delivery is to be completed by the end of the year.

SIR JOHN CASS COLLEGE, Jewry Street, Aldgate, London, E.C.3, announce a number of evening classes on specialized subjects, which include spectrochemical analysis; radio-active isotopes in metallurgy and ceramics; radio chemistry and radio activity; electronic computing systems; absorption spectroscopy; and statistical methods in scientific and industrial research. Full details of these courses can be obtained on application to the secretary of the College at the above address.

THE INDUSTRIAL SECTION of the Central Film Library, Government Buildings, Bromyard Avenue, Acton, London, W.3, in its "New Releases," Autumn 1959, lists 22 films. Some of these are eminently suitable for showing at foundry technical meetings as, for instance, "Vanishing Dust," which is issued free of charge. It is from F. H. Lloyd & Company, Limited, and is of 11 min. duration. Programme secretaries of technical institutes and especially branch secretaries are advised to write for this list.

THE BOARD of the Imperial Aluminium Company has been constituted as follows:—From Imperial Chemical Industries: Dr. JAMES TAYLOR (chairman), Mr. BERKELEY VILLIERS (managing director) and Mr. MICHAEL CLAPHAM. From the Aluminium Company of America: Mr. DUBOSE AVERY and Mr. F. J. RESCH. The Imperial Aluminium Company was formed recently to link Imperial Chemical Industries with the Aluminum Company of America in the manufacture of wrought-aluminium products.

THE MINISTER OF EDUCATION has awarded technical State Scholarships to three apprentices at Leyland Motors, Limited, and has placed five more of the company's employees on the reserve list for this type of scholarship. The boys are part-time students at Leyland Motors day continuation school. Mr. H. Bayley, principal of the school, said that since the school's syllabus had been altered two years ago to take boys up to National Certificate level, five State Scholarships had been awarded to employees.

THE PLACING OF MUNICIPAL CONTRACTS in order to provide employment for Scottish workers was urged at a meeting of Glasgow Corporation on September 4, and it was ultimately agreed to give a Falkirk firm part of an order for electric cookers. A minute of the Housing Committee recommended acceptance of an offer by the GEC, Limited, Glasgow, to supply 1,500 three-plate cookers at a total cost of £33,900. An amendment that 750 of the cookers be purchased from GEC for £16,950 and the other 750 from Falkirk Iron Company, Limited, at a cost of £17,062 10s., was carried.

DAVY AND UNITED ENGINEERING, LIMITED, Sheffield, have received a contract for building a 68-in. semi-continuous hot strip mill for the Ravenscraig works of Colvilles, Limited, Glasgow. The contract is worth more than £4,000,000, and 9,000 tons of machinery will be made, much of it at the Glasgow works of the Sheffield firm. The new mill will produce strip and light plate from 24-in. to 60-in. wide in coils weighing up to 40,000 lb. and will be driven by over 47,000 h.p. It will be designed for an eventual output of more than 1,500,000 tons a year but will start with an output of 500,000 tons a year.

DOUGLAS FRASER & SONS, LIMITED, engineers, Arbroath, have announced the following changes in their directorate:—Mr. HUGH FRASER has been appointed chairman in place of Mr. JOHN G. FRASER, who has resigned from the chairmanship on his appointment as managing director of Giddings & Lewis-Fraser, Limited (the merger of the American firm of Giddings & Lewis with Fraser & Sons was announced in the JOURNAL, August 20 issue). In addition to being chairman of Douglas Fraser & Sons, Mr. Hugh Fraser is the textile-machinery manager of Giddings & Lewis-Fraser, Limited. Mr. KEITH H. FRASER has been appointed managing director of the spinning, Baffeez, and candlewick activities of Fraser & Sons. Mr. ALEXANDER PETRIE, secretary of the company, continues to act in that capacity and is also secretary of Giddings & Lewis-Fraser.

Recent Wills

BAXTER, W. B., former director of the United Steel Companies, Limited, Sheffield, vice-president of the Iron and Steel Institute, and chairman of the Lincolnshire Ironmasters' Association ... £22,583

BOYD, SIR ARCHIBALD JOHN, chairman of Metropolitan-Cammell Carriage & Wagon Company, Limited, a director of Cammell Laird, Limited, Associated Electrical Industries, and other companies ... £46,547

ROWSE, A. A., chairman of Venner, Limited, electro-mechanical engineers, of New Malden (Surrey), formerly for many years a director and production manager of Morris Motors, Limited ... £242,180

BURTON, MARK, former managing director of Marshall, Sons & Company, Limited, manufacturers of tractors, steam-raising equipment, etc., of Gainsborough (Lincs) £32,335

Changes of Name

Among companies which have recently changed their names are those listed below. The new titles are given in parentheses.

B.S.A. CARS, LIMITED, Armoury Road, Birmingham (Jessop-Saville (Small Tools), Limited).

SKELTON, SLEAT & COMPANY, LIMITED, Castle Gate, Reigate, Surrey (Redland Engineering, Limited).

CAMDEN PLATING COMPANY LIMITED, 77, Parkway, London, N.W.1 (Camden Plating Company (Holdings), Limited).

B.S.K. INDUSTRIES (ENGINEERING), LIMITED, St. Cuthberts Road, Gateshead 8 (Bede Engineering Company, Limited).

MAPLE ENGINEERING COMPANY, LIMITED, 14, Maple Road, Redhill, Surrey (Deerbarn Engineering Company, Limited).

WILLIAM JESSOP & SONS, LIMITED, ironmasters, steelmakers, etc., of Brightside Works, Sheffield (Jessop-Saville, Limited).

STRAIGHT TORQUE, LIMITED, ironfounders, engineers, etc., of Berkeley House, Hay Hill, London, W.1 (Ambuco, Limited).

LITTLEWOOD & HARLING, LIMITED, millwrights, ironfounders, etc., of Waverley Works, St. Thomas Road, Huddersfield (Littlewood Engineers (1959), Limited).

SIMWAY, LIMITED, manufacturers of stoves and ovens, etc., of 52, London Road, London, S.E.1 (Aquafont Equipment, Limited).

For Rapid Baking . . .

FOUNDRIMET FOUNDRY & METALLURGICAL F.&M.S.L.

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CORE OIL

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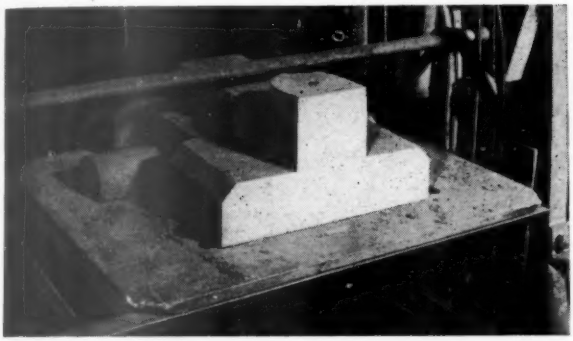

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HIGHER DRY STRENGTH THAN LINSEED OIL AT SHORTER BAKING CYCLES

- Economical in use
- More gallons per ton
- Not critical to Baking Temperature
- Cores uniformly baked

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Raw Material Markets

Iron and Steel

The steady improvement in trading among the iron-foundries is maintained. Nevertheless, the volume of work on hand is still well below capacity. High-duty castings are being called for at a good rate from the engineering and speciality foundries, the motor vehicle trade continuing to be well to the fore in this respect. Other consumers are also taking up larger quantities of these castings. There is a better demand from the machine-tool trade, while the steelworks are using a larger tonnage of ingot moulds and castings.

Pig-iron is plentiful, despite the fact that production is not at capacity. Both producers and consumers are carrying sizable stocks. Chief demand is for low-phosphorus iron, but there is no difficulty in meeting all needs. Hematite and refined irons are easy, and the quantities of high-phosphorus iron available far exceed requirements. The steelworks are taking up moderate tonnages of basic iron, and there is plenty to spare.

Scrap for the foundries is forthcoming satisfactorily, except, perhaps, for the higher grades of cast-iron scrap such as cylinder blocks. Good deliveries of foundry coke are to hand, and ganister, limestone, and firebricks are easily obtainable.

The re-rollers maintain their improved rate of production and continue to receive increased business for small bars and light sections. Reinforcing rods are also in heavy demand. There is an increasing call for steel semis from home steelworks, most of which have orders on hand to cover outputs for several weeks ahead. Stocks of billets, blooms, etc., at most of the re-rollers are insufficient to cope with current consumption, and difficulty is being experienced in placing orders with the steelworks for prompt delivery.

Non-ferrous Metals

Copper is an interesting market and pressures now being exerted may soon determine a new trend in prices on both sides of the Atlantic. The present position is that at least 75 per cent. of the US domestic production of copper is tied up by the strike of the Mine, Mill, and Smelter Workers' Union. In fact, of the major producers, only American Smelting & Refining is still in production. On a global basis, this means that approximately 40 per cent. of the world's copper production is strikebound and, therefore, a continuation of this strike for any length of time must whittle down stocks and push up prices. The reason this has happened in only a small way so far is because until now hopes were that the strike would not be a long drawn out affair and, secondly, there is a great deal of uncertainty as to whether the longshoremen will go on strike at the end of this month.

However, the current belief is that the Mine, Mill, and Smelter Workers' Union will not easily be brought to terms and that there may well be something like near panic buying of copper before the end of the month as a hedge against the longshoremen's strike. As an added incentive for consumers to watch closely the market, there is the report available that labour difficulties exist at the El Teniente Mine in Chile. In these circumstances the US custom smelters refused to quote a price for a couple of days last week, the price of 30 cents a pound being a purely nominal listing. By the end of the week, however, the custom smelters had come back into action, having raised their price to 33 cents a pound, a rise of 3 cents a pound. This is equivalent to £264 a ton and compares with the unchanged producers' price of 30 cents a pound, or £240 a ton.

The London market has benefited from this situation and the price has been rising gradually, with demand from domestic and continental sources improving. The immediate outlook, given a continuation of the present situation, is for the price to increase gradually until stocks show visible signs of decreasing and the for the quotation to go ahead more sharply.

Tin was quiet in front of the official communiqué issued by the International Tin Council towards the end of last week. Prices trended easier in London and in the East, although the undertone in both centres was firm. In the event, the ITC raised the permissible level of exports for the fourth quarter of this year by 5,000 tons to 30,000 tons. This compares with a quota increase of 2,000 tons for the third quarter and is indicative of the confidence in the outlook for the metal. For Malaya, it will mean that the mines are producing at nearly 80 per cent. of capacity. The council also agreed to continue the buffer stock manager's operations between £780 and £830 a ton until the end of this year. The council gave no clue as to the present size of the buffer stock beyond saying that it contained 21,020 tons at the end of March last. The next meeting of the International Tin Council is fixed for December 1.

Marketwise, tin remains steady and the belief is that the extra quotas will be easily absorbed. The market is still held down by the US steel strike, but when that industry is again in full production the price is expected to go ahead slowly until stocks in the buffer stock are brought down to a more manageable tonnage.

The feature in lead has been the rise in the US price by 1 cent to 13 cents a pound. The strike in the US copper industry is hampering the production of lead and zinc, which has helped to put some strength into this market. At present, work is still going on at the Bunker Hill Company, the second largest lead producer in the US, but labour is working on a day-to-day b. with the deadline for a strike at Tuesday next. Ori ally, the Mine Mill, and Smelter Workers' Union threatened to strike against the company on August 31. The London market is quietly steady with sentiment good about the future outlook for the metal. Nevertheless, there has not been any real favourable reaction to the rise in the US price, with the result that the LME quotation is slipping slowly back to around £ a ton.

Zinc is irregular. This is partly due to the absence of any real market activity in "Prime Western" in the US because of the steel strike and partly because prompt metal is somewhat scarce at times in London. Overall demand is, however, satisfactory and the price in the UK, at around £86 a ton, compares with the US price of 11 cents a pound, or £88 a ton.

National Society of Master Patternmakers

The National Society of Master Patternmakers opens its 1950/60 programme with a lecture to be given by Mr. H. G. C. King (of the Locomotive Works of British Railways, Crewe) on September 22 at the Charing Cross Hotel, London, W.C.2, commencing 7 p.m. In his paper, "Introduction to Patternmaking in Plastics," Mr. King will deal with materials and equipment required, production of master patterns and moulds, and various methods of pattern manufacture from the solid casting of small patterns to the building of large patterns by a system of lamination. The paper will be illustrated by slides and there will also be practical examples available for inspection. Tea and light refreshments will be provided immediately prior to the meeting by the courtesy of Mr. B. Levy of B. Levy & Company (Patterns), Limited. (Non-members will also be welcomed.)

Baker Perkins Foundry Machinery at work.....

at R. & A. Main Ltd.

R. & A. Main Ltd. use this 'Medium' Rotary Table Shot Blast Machine for a wide range of application at a high production rate. The special control desk includes signal lights, 24 volt current socket for inspection and ammeters indicating the shot output of the patented bi-phase impellers. The wiring circuit is arranged for automatic operation to cut out human errors.

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Bedewell Works · Hebburn on Tyne · England *Tel: Jarrow 897124* BP/F2

HISTORICAL NOTE

R. & A. Main Ltd. were established in Glasgow in the 1870's. Following the amalgamation with Thomas Glover & Co. Ltd. in 1897, extensive sites were acquired at Edmonton and Falkirk. They produce a wide range of domestic appliances including the 'Century' gas cooker, the 'Century' gas heater and the Main No. 36.c. Refrigerator — the first to carry a ten year guarantee.

Imports and Exports of Iron and Steel in July

The following tables, based on Board of Trade returns, give figures of imports and exports or iron and steel in July. Totals for the first seven months of this year and last are also included.

Total Exports of Iron and Steel

Destination.	Month ended July 31.	Seven months ended July 31.	
	1959.	1958.	1959.
	Tons.	Tons.	Tons.
Cyprus	137	3,880	911
Sierra Leone	2,363	8,279	6,055
Ghana	2,506	8,153	17,965
Nigeria	6,159	38,962	44,271
Union of South Africa	2,969	63,264	26,079
Rhodesia and Nyasaland	2,823	23,020	13,012
Tanganyika	1,793	7,370	10,300
Kenya	1,178	26,957	11,998
Uganda	111	1,810	2,924
Mauritius	186	2,288	824
Aden	441	2,030	1,748
Bahrein, Qatar, and Trucial States	830	5,436	4,905
Kuwait	675	25,960	7,432
India	14,591	79,892	103,373
Pakistan	3,388	40,418	19,680
Singapore	1,599	21,730	12,971
Malaya	962	9,426	6,529
Ceylon	1,762	17,477	27,182
British North Borneo	241	1,404	1,743
Hongkong	6,887	33,367	40,763
Australia	6,833	56,558	49,655
New Zealand	10,315	109,199	55,199
Canada	23,103	118,634	99,940
Jamaica	3,118	11,497	13,252
Trinidad	5,340	31,750	26,052
British Guiana	1,174	4,728	4,192
Other Commonwealth countries	2,281	20,524	21,572
Eire	3,939	30,386	27,445
Soviet Union	3,563	12,105	7,501
Finland	3,468	28,498	20,078
Sweden	9,134	77,674	67,714
Norway	6,427	54,020	52,430
Denmark	8,812	54,974	56,101
Western Germany	10,699	19,108	63,320
Netherlands	13,684	49,658	55,870
Belgium	2,758	13,997	17,262
France	433	1,733	1,627
Switzerland	678	6,640	4,810
Portugal	1,289	8,750	9,737
Spain	3,511	32,343	19,115
Italy	5,983	24,494	31,669
Austria	477	6,928	2,108
Yugoslavia	59	2,521	1,776
Greece	1,007	8,697	6,972
Turkey	787	3,280	4,059
Netherlands Antilles	165	1,247	1,694
Portuguese East Africa	92	1,530	810
Egypt	49	10,478	1,272
Sudan	609	24,180	4,910
Lebanon	36	8,350	1,739
Israel	1,838	4,774	7,745
Saudi Arabia	335	3,279	2,824
Iraq	3,359	21,411	50,810
Iran	3,463	21,765	16,854
Burma	1,189	5,859	5,655
Thailand	962	3,913	5,677
Indonesia	762	1,265	3,310
Philippine Republic	770	2,134	3,098
USA	23,160	46,272	90,486
Cuba	358	3,447	4,480
Columbia	337	4,580	1,536
Venezuela	6,940	49,954	46,575
Ecuador	18	1,914	546
Peru	72	7,093	1,460
Chile	94	3,658	915
Uruguay	5	700	705
Agrentina	17,124	85,047	122,321
Other foreign countries	50,443	61,558	169,645
TOTAL	292,648	1,584,232	1,625,188

LAPORTE INDUSTRIES, LIMITED—Mr. B. E. A. Vigers has relinquished the position of assistant managing director and has been appointed a deputy chairman of the company and technical director of the Laporte group of companies.

Total Imports of Iron and Steel

From	Month ended July 31.	Seven months ended July 31.	
	1959.	1958.	1959.
	Tons.	Tons.	Tons.
Rhodesia and Nyasaland	455	4,262	2,981
Canada	1,579	11,978	9,744
Other Commonwealth countries and Eire	3,381	14,848	19,366
Soviet Union	8,520	107,521	25,353
Sweden	1,585	20,357	15,234
Norway	7,079	44,722	47,056
Poland	426	83	3,922
Western Germany	7,439	48,439	34,864
Netherlands	13,707	88,708	103,507
Belgium	816	58,432	14,526
Luxembourg	581	4,788	4,495
France	2,574	13,509	13,410
Italy	3,582	3,828	8,054
Austria	705	3,022	2,537
Japan	—	2,232	—
USA	1,709	113,777	17,973
Other foreign countries	3,331	2,989	10,053
TOTAL	57,469	543,495	332,375
Iron and steel scrap and waste, fit only for the recovery of metal	486	54,837	2,511

Exports of Iron and Steel by Products

Product.	Month ended July 31.	Seven months ended July 31.	
	1959.	1958.	1959.
	Tons.	Tons.	Tons.
Pig-iron	10,755	68,734	72,239
Ferro-columbium (niobium)	1	19	26
Ferro-tungsten	102	394	739
Other ferro-alloys	511	2,014	2,987
Ingots, blooms, billets, slabs, sheet bars (incl. tinplate bars), and similar primary forms	6,648	7,154	42,530
Pieces roughly shaped by forging*	79	4,870	1,018
Iron bars, rods, angles, shapes, and sections	155	994	704
Steel bars, rods, angles, sections, and shapes	48,638	204,882	215,118
Iron plates and sheets	19	1,795	238
Universal plates	806	3,114	4,614
Steel plates, 3mm. and under 4.5mm. thickness	4,476	4,562	26,603
Ditto, 4.5mm. or more in thickness	26,559	111,958	109,766
Blacksheets and blackplate	24,336	174,478	153,673
Hoop and strip	9,328	35,168	49,379
Tinplate	49,201	213,699	275,842
Decorated tinplate	922	1,662	5,529
Galvanized sheets	8,527	42,771	53,223
Other (incl. tinned sheets, terneplate, and ternesheets)	2,829	7,852	12,569
Railway and tramway construction material	16,624	152,612	97,808
Wire rods of steel (incl. alloy steel)	6,603	21,924	30,598
Wire	9,161	61,394	61,918
Tubes, pipes, and fittings	66,368	462,182	408,007
TOTAL	292,648	1,584,232	1,625,188

* The figures for 1959 are not completely comparable with those for previous years.

Mr. E. N. EVANS has been elected a director of Blackstone & Company, Limited, diesel-engine manufacturers, Stamford, Lincolnshire, a member of the R. A. Lister group.

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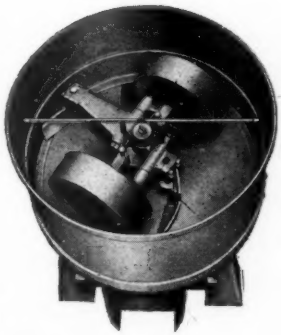
that well mixed sand and first-class mulling produces better castings, reduces scrap and fettling costs. Ensure these advantages by using

Richards

Mull Mixer



Modern design avoids breakdowns and expensive maintenance

RICHARDS STRUCTURAL STEEL CO. LTD.
PHOENIX IRON WORKS · LEICESTER
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Pressure Die-casters never say die!

Never say die when it comes to casting,
DIE SLICK'S a trick that's everlasting,
Here's a slick will make you master,
Casting cleaner, slicker, faster.

When you're in deep water friend,
And you feel this is the end.
When your cherished castings fail,
Holler for the DIE SLICK pail.

Foremen know its famous touch,
Just a dab or two, not much
Will transform a scene so tragic,
Successfully, as though by magic.

For aluminium, brass or zinc,
DIE SLICK is the missing link.
A choice of grades all made to measure,
Casting then becomes a pleasure.

Never say die when it comes to casting,
DIE SLICK'S a trick that's everlasting.

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Telephone: Swiss Cottage 3281-2-3.

Current Prices of Iron, Steel, and Non-ferrous Metals

(*Delivered unless otherwise stated*)

September 9, 1959

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2, 10-ton lots or over: Middlesbrough, £21 6s. 0d.; Birmingham, £20 18s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.40 per cent. P, 6-ton lots or over, £23 5s. 0d., delivered Birmingham, £23 10s. 0d., delivered Grangemouth.

Cylinder and Refined Irons.—North Zone, £25 6s. 6d.; South Zone, £25 9s. 0d.

Refined Malleable.—P, 0.10 per cent. max.: North Zone, £26 6s. 6d.; South Zone, £26 9s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent., 6-ton lots or over: N.-E. of England (local iron), £24 14s. 0d.; Scotland (Scotch iron), Zone S.1, £25 0s. 6d.; Sheffield, £26 2s. 6d.; Birmingham, £26 11s. 6d.; Wales (Welsh iron), £24 14s. 0d.

Basic Pig-iron.—£20 3s. 0d., delivered Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leicestershire, in 6-ton lots or over.

FERRO-ALLOYS

(*Per ton unless otherwise stated, delivered*)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £41 0s. 0d. to £43 10s. 0d., scale 15s. 0d. per unit; 75 per cent. Si, £56 10s. 0d. to £60 10s. 0d., scale 15s. 0d. to 16s. 0d. per unit.

Ferro-vanadium.—50/60 per cent., 22s. 6d. per lb. of V.

Ferro-molybdenum.—65/70 per cent., carbon-free, 12s. 10d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £287 0s. 0d.

Ferro-tungsten.—80/85 per cent., 9s. 10d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 12s. 10d. per lb. of W.

Ferro-chrome (6-ton lots and over).—4/6 per cent. C, £77 0s. 0d. to £81 0s. 0d., basis 60 per cent., Cr, scale 26s. 0d. to 27s. 6d. per unit; over 6 per cent. C, £74 10s. 0d. to £77 10s. 0d., basis 60 per cent. Cr, scale 26s. 0d. to 27s. 6d. per unit; 2 per cent. C,* 1s. 7½d. to 1s. 10½d. per lb. Cr.; 1 per cent. C,* 1s. 8d. to 1s. 11d. per lb. Cr; 0.15 per cent. C,* 1s. 9d. to 2s. 0d. per lb. Cr; 0.10 per cent. C,* 1s. 9½d. to 2s. 0½d. per lb. Cr; 0.06 per cent. C,* 1s. 9¾d. to 2s. 0¾d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 6s. 10d. per lb.

Metallic Manganese.—94/96 per cent., carbon-free, £245 0s. 0d.; 96/98 per cent., £275 0s. 0d.

Ferro-columbium.—65/72 per cent., Cb + Ta, 19s. 9d. per lb., Cb + Ta.

Ferro-manganese (standard).—78 per cent., £66 0s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft u.t., 100 tons & over, £31 15s. 6d.; tested, 0.08 to 0.33 per cent. C, 6 to 35 tons, £33 15s. 6d.; hard (0.41 to 0.60 per cent. C), under 10 tons, £34 17s. 0d.; silico-manganese, under 10 tons. £43 16s. 6d.; free-cutting, under 10 tons, £36 14s. 6d. SIEMENS MARTIN ACID (under 10 tons): Up to 0.25 per cent. C, £41 1s. 0d.; silico-manganese, £44 4s. 0d.

Billets, Blooms, and Slabs for Forging and for Stamping (under 10 tons).—Basic, soft, up to 0.33 per cent. C, £38 10s. 0d.; basic hard, over 0.41 up to 0.60 per cent. C, £39 12s. 6d.; acid, up to 0.25 per cent. C, £43 4s. 0d.

* Average 68–70 per cent.

FINISHED STEEL

Heavy Plates and Sections (under 10 tons).—Ship plates, (N.-E. Coast), £42 2s. 0d.; boiler plates (N.-E Coast), £44 12s. 0d.; floor plates (N.-E. Coast), £43 11s. 0d.; angles (N.-E. Coast), £39 16s. 6d.; joists (N.-E. Coast), £39 12s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., and flats 5 in. wide and under, untested soft basic, 50 tons and over, £39 1s. 0d.; under 10 tons to 4 tons, £40 18s. 0d.; under 4 tons to 2 tons, £41 3s. 0d.; hoop and strip, coils, 100 tons and over, £38 0s. 0d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g., 25 tons to under 50 tons, £43 16s. 0d.; black sheets (hand mill), 24g., 10 tons and over, £57 14s. 6d.; galvanized corrugated sheets, 24g., 10 tons and over, £67 4s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £68 10s. 0d.; nickel-chrome, £99 4s. 0d.; nickel-chrome-molybdenum, £111 17s. 0d., in lots of 5 tons to under 10 tons.

NON-FERROUS METALS

Copper.—Cash, £236 0s. 0d. to £236 5s. 0d.; three months, £235 5s. 0d. to £235 10s. 0d.; settlement, £236 5s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 2s. 3½d. per lb.; rods, 254s. 0d. per cwt. basis; 20 s.w.g., 289s. 0d. per cwt.

Tin.—Cash, £793 0s. 0d. to £793 10s. 0d.; three months, £792 0s. 0d. to £792 10s. 0d.; settlement, £793 10s. 0d.

Lead (Refined Pig).—First half September, £71 15s. 0d. to £72 0s. 0d.; first half December, £73 2s. 6d. to £73 5s. 0d.

Zinc.—First half September, £86 17s. 6d. to £87 0s. 0d.; first half December, £85 5s. 0d. to £85 7s. 6d.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £121 15s. 0d.; rolled zinc (boiler plates), all English destinations, £119 10s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £99 0s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 1s. 10½d. per lb.; sheets to 10 w.g., 202s. 6d. per cwt.; wire, 2s. 8½d.; rolled metal, 202s. 6d. per cwt.

Brass (Brazing).—BS1400, B3, £156; B6, £200.

Brass (High Tensile).—BS1400, HTB1, £186; HTB2, £202; HTB3, £213.

Gunmetal.—BS1400, LG2, £192; LG3, £202; G1, 1%, £252; G1, 1%, £240.

Phosphor Bronze.—BS1400, PB1 (AID released), £289; BS1400, 90/10/1, £271.

Leaded Phosphor Bronze.—BS1400, LPB1, £213.

Phosphor Bronze Strip, etc.—Strip, 290s. 9d. per cwt.; wire, 4s. 1½d. per lb.; rods, 3s. 4½d.; tubes, 3s. 4½d.; chill cast bars: solids 3s. 4½d.; cored 3s. 5½d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 10½d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 3½d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 4s. 2½d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 3d. per lb. Antimony, English, 99 per cent., £190 0s. 0d. Quicksilver, ex-warehouse, £71 10s. 0d. Nickel, £600 0s. 0d. Aluminium, ingots, £180 0s. 0d.; aluminium bronze (BS1400), AB1, £237; AB2, £248.